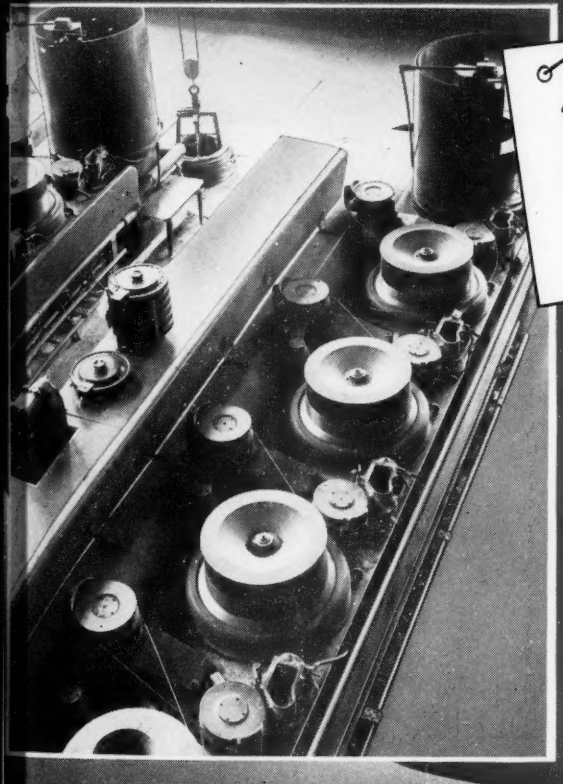
WIRE AND WIRE PRODUCTS

SEPTEMBER 1954

with

VAUGHN® Motoblox

you enjoy



NO STORAGE
NO ACCUMULATION
NO TWIST

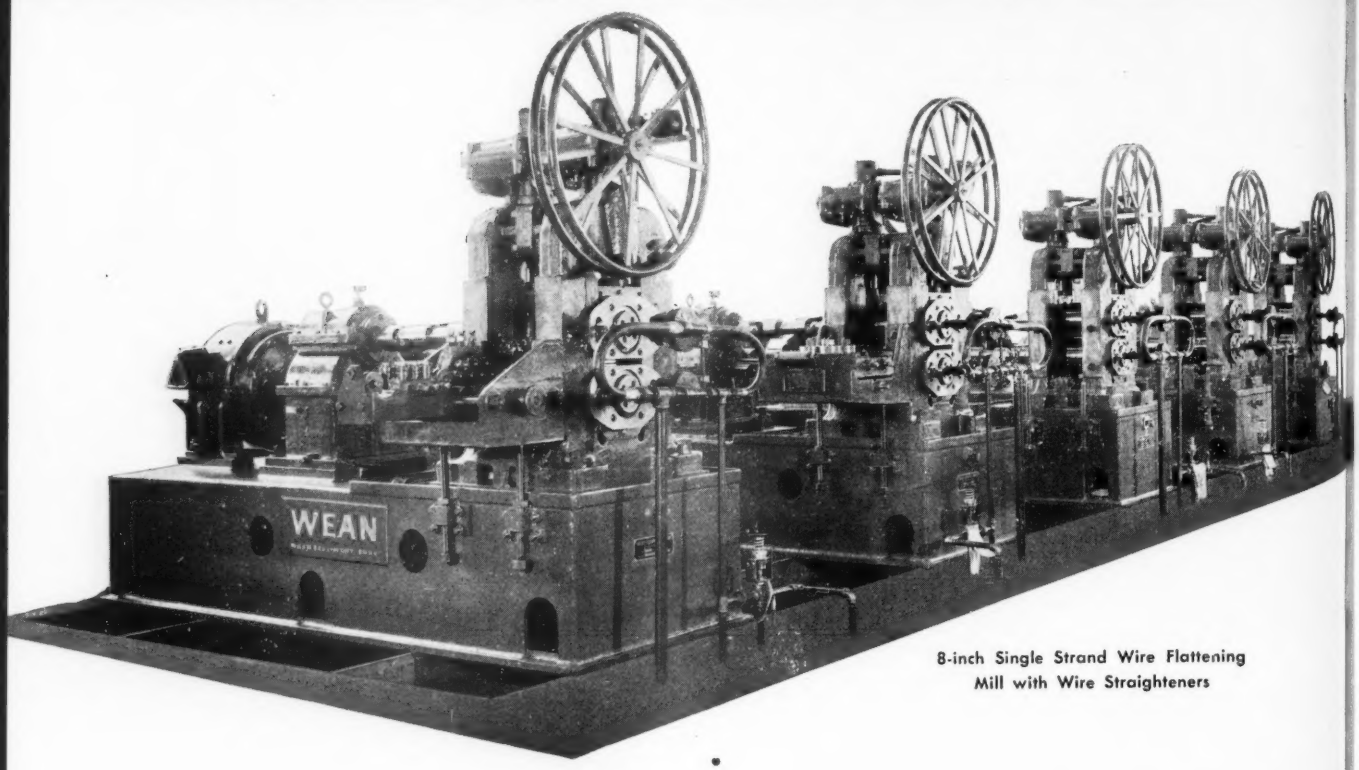
Always

SIMPLE, AUTOMATIC
LOW COST OPERATION

THE VAUGHN MACHINERY CO.
CUYAHOGA FALLS, OHIO, U. S. A.
COMPLETE COLD DRAWING EQUIPMENT—Continuous or Single Hole
. . . for the Largest Bars and Tubes . . . for the Smallest Wire . . . Ferrous,
Non-Ferrous Materials or their Alloys.

OFFICIAL PUBLICATION OF THE WIRE ASSOCIATION

Wean



8-inch Single Strand Wire Flattening Mill with Wire Straighteners

A COMPLETE ENGINEERING SERVICE FOR WIRE MILL INSTALLATIONS

Complete Installations for Electro Galvanizing, Hot Dip Galvanizing, Patenting, Tinning, Wire Flattening, Nail Galvanizing and Blueing.

Complete Equipment for the Manufacture of Hexagon Netting, Hinge Joint Fence and Barbed Wire.

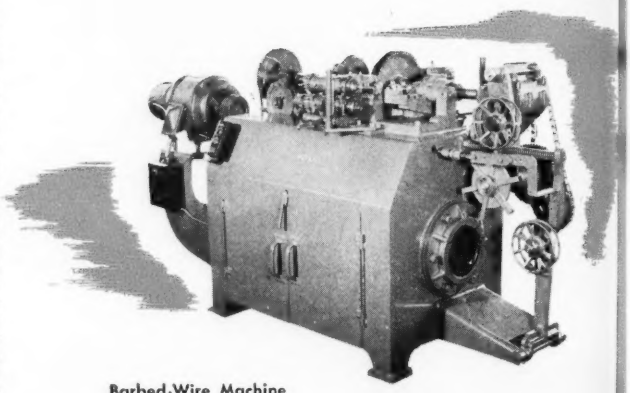
CHECK WEAN FIRST FOR WIRE MILL EQUIPMENT

STRIP MACHINERY

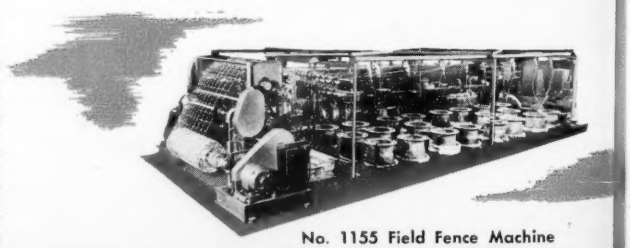
Slitting Installations. Cut to Length Installations. Bearing Metal Coating Installations. Two-Hi Rolling Mill Applications. Strip Grinding Installations. Levelers, Uncoilers, Pinch Rolls, Shears for Strip Processing lines.

WEAN EQUIPMENT CORPORATION

22800 LAKELAND BLVD. • CLEVELAND, OHIO

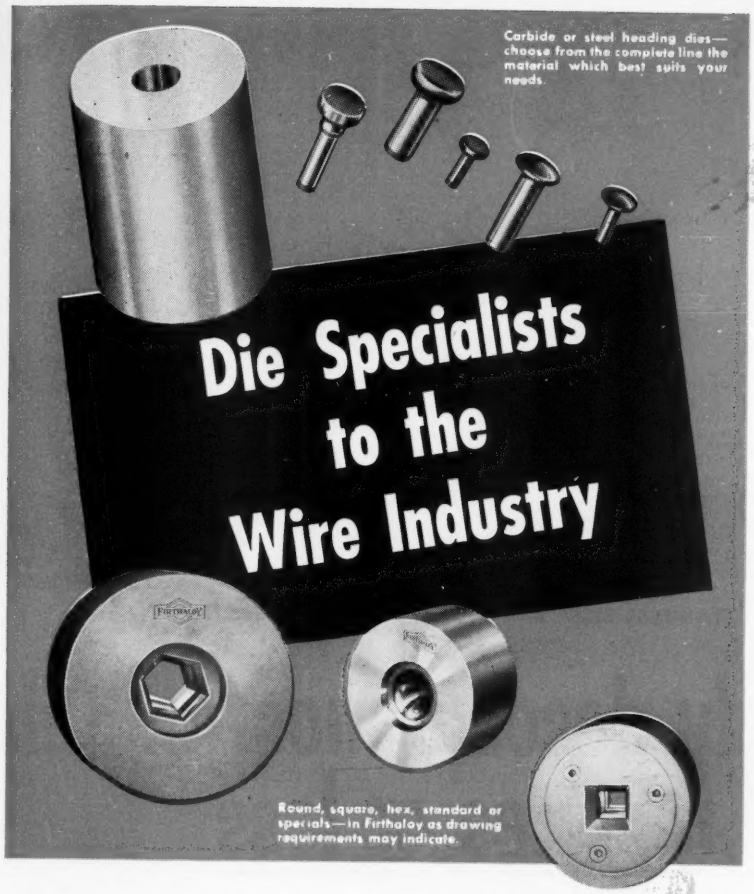


Barbed-Wire Machine



No. 1155 Field Fence Machine

Wean *Equipment Corporation*


Carbide or steel heading dies—choose from the complete line the material which best suits your needs.
Die Specialists to the Wire Industry
Round, square, hex, standard or specials—in Firthaloy as drawing requirements may indicate.

A COMPLETE LINE...CARBIDE AND STEEL

• Firth Sterling offers wire manufacturers and fabricators the advantages of a *single* source of supply of materials for both tungsten carbide and tool steel for drawing, shaping, forming and heading dies. This *complete* line, from famous Firthaloy, for maximum performance where carbide is a requirement, through almost one hundred grades of high speed and tool steels for header dies, hammer punches, inserts, cut-off knives, roll guides, die casings, forming rolls and similar applications, saves you time and money.

Firth Sterling representatives are skilled in interpreting the needs of the wire industry and in suggesting the exactly right steel or carbide for specific applications. Because they know and sell both, you can depend on their unbiased recommendations to result in better, more economical tooling.

Attention: Fastener Industry! C.H.Q. Die Steel makes cold heading records

C.H.Q. solid die after 192,000 run.

A nationally known fastener manufacturer* recently made comparative tests of solid steel cold heading dies, under carefully controlled conditions, producing ⅝" square head machine bolts from 1020 steel on a Waterbury Farrel double stroke automatic.

Firth Sterling C.H.Q. came off with top honors and the highest production ever obtained by this manufacturer from any steel die . . . 192,045 both ends. (78,860 one end, 59 Rockwell C; 113,185 other end, 61 Rockwell C.) Standard competitive carbon steel dies produced only 50,000-60,000 both ends and ultimately failed by cracking axially. The C.H.Q. die wore oversize but longitudinally etched section revealed not even a hairline crack.

Ask for technical literature on C.H.Q.—or a Firth Sterling representative will discuss your die problems.

*(name on request)

R-299

Firth Sterling

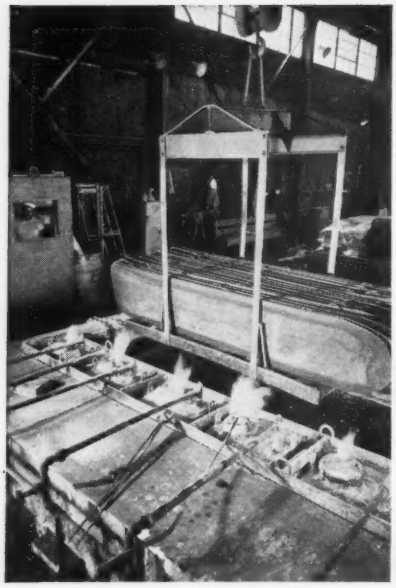
—INC—

GENERAL OFFICES: 3113 FORBES ST., PITTSBURGH 30, PA.

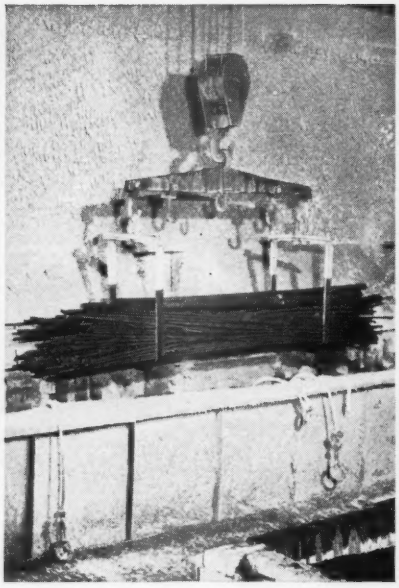
OFFICES AND WAREHOUSES*: BIRMINGHAM CHICAGO* CLEVELAND DAYTON DETROIT* HARTFORD* HOUSTON LOS ANGELES* NEW YORK PHILADELPHIA PITTSBURGH WASHINGTON WESTFIELD, N.J

PRODUCTS OF FIRTH STERLING METALLURGY

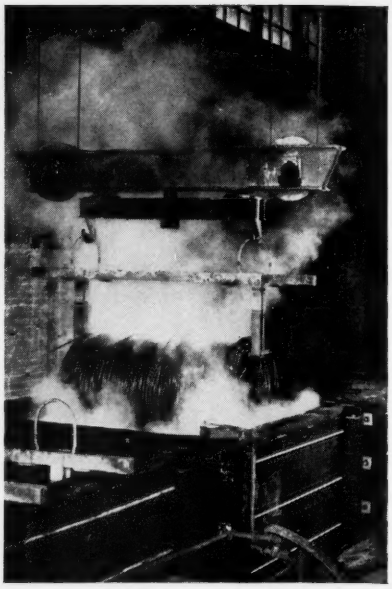
High Speed Steels
Tool & Die Steels
Stainless Specialties
High Temperature Alloys
Sintered Tungsten Carbides
Firth Heavy Metal
Chromium Carbides
High Temperature Cermets
Zirconium



TOOL STEEL SHEETS



STAINLESS STEEL BAR STOCK



CARBON STEEL WIRE

You can safely descale most metals in 20 minutes or less

WITH THE DU PONT SODIUM HYDRIDE PROCESS

In 10 to 20 minutes, sheets, bars, wire, rods, forgings and fabricated articles are completely descaled with the Du Pont Sodium Hydride Descaling Process. Even heavily scaled forgings (½" scale thickness) take less than an hour. And in only 15 seconds you can get cold reduced-annealed strip clean and bright!

With hydride descaling, there's never any danger of etching or pitting . . . never a costly reject due to loss of gauge. Base metal is always protected, *since bath action stops the instant scale is reduced.* And retreatments are rarely needed with most metals. One pass through the sodium hydride bath will do the job completely.

TECHNICAL SERVICE AVAILABLE

If you are descaling metals which are unaffected by fused caustic at 700°F., it will be to your advantage to talk to us about the Du Pont Sodium Hydride Process. Du Pont pioneered this modern descaling method and can bring a depth of technical experience to bear on your descaling problems.

There's no cost for this service which includes laboratory investigation of problems, plus expert aid in construction, installation and operation of the process. Just call our nearest district office or send in coupon below.

DISTRICT AND SALES OFFICES: Baltimore • Boston • Charlotte • Chicago • Cincinnati • Cleveland • Detroit • Kansas City* • Los Angeles • New York • Philadelphia • Pittsburgh • San Francisco *Barada & Page, Inc.

Du Pont — Producer of Sodium / Pioneer of Hydride Descaling

DU PONT
REG. U. S. PAT. OFF.

BETTER THINGS FOR BETTER LIVING...*THROUGH CHEMISTRY*

FOR MORE INFORMATION

E. I. du Pont de Nemours & Co. (Inc.), WW-94
Electrochemicals Dept., Wilmington 98, Del.

- ☐ Please send me your free booklet on Sodium Hydride Descaling.
- ☐ Please have one of your technical men call. I am interested in descaling _____

Name _____

Firm _____

Address _____

City _____ *State* _____

Chase Copper Alloy Wire

gives you these finer qualities . . .

Chase wire combines *high ductility* with *great tensile strength.* Result: excellent spring properties. Chase wire has great uniformity of set and temper. Result: it uncoils without time-wasting twists and tangles. Chase wire has precisely uniform gauge . . . texture . . . color . . . is free from physical defects. Next time *you* need wire, ask for the finest...call your Chase wholesaler or the nearest Chase warehouse. Result: satisfaction!

Chase ®

BRASS & COPPER CO.

CHASE NOW SELLS STAINLESS STEEL, TOO!

WATERBURY 20, CONNECTICUT • SUBSIDIARY OF KENNECOTT COPPER CORPORATION

Write Today for Free Folder "Chase Cold-Heading Extruded Brass and Copper Alloy Wire."

The Nation's Headquarters for Brass & Copper

Albany†	Chicago	Denver†	Kansas City, Mo.	Newark	Pittsburgh	San Francisco
Atlanta	Cincinnati	Detroit	Los Angeles	New Orleans	Providence	Seattle
Baltimore	Cleveland	Houston	Milwaukee	New York	Rochester†	Waterbury
Boston	Dallas	Indianapolis	Minneapolis	Philadelphia	St. Louis	(†sales office only)

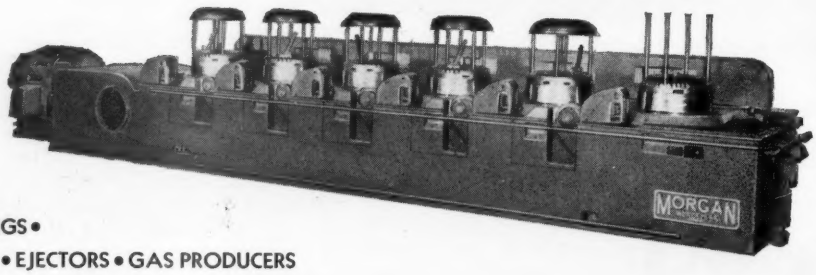
So Simple—yet so important!

AIR COOLING
Cool the wire and you can draw any grade of wire at high speeds. That's what Morgan-Connors do.

BUILT COMPACTLY
Keep the size of the wire machine to a minimum and you'll save valuable space for more machinery. That's how Morgan-Connors are built.

CONSERVES POWER
Use one motor of the right capacity and you'll not need several smaller ones. That's how Morgan-Connors save on power.

To be sure you're getting top production efficiency, ask the opinion of a Morgan engineer.



Type BW
Morgan-Connor Wire Machine

ROLLING MILLS • MORGOIL BEARINGS •
REGENERATIVE FURNACE CONTROL • EJECTORS • GAS PRODUCERS

MORGAN-CONNOR
WIRE MACHINES

WM-80

MORGAN CONSTRUCTION COMPANY • WORCESTER, MASSACHUSETTS

WIRE AND WIRE PRODUCTS*

Reg. U. S. Pat. Off.

A monthly publication devoted to the production of Wire, Rod and Strip, Wire and Rod Products and Insulated Wire and Cable.

DRAWING — ROLLING — EXTRUDING — FORMING — FABRICATING

Vol. 29 SEPTEMBER, 1954 No. 9

Designated as Official Publication By The Wire Association

Contents

Editor's Desk 959

Wire Flattening—An Appraisal of Today's Theory and Practice—Part II
by A. I. Nussbaum 961

Heat Aging Characteristics of Insulating Varnishes
by H. I. Morgan and K. N. Mathes 967

Johnson Steel and Wire Company Modernization Program 975

Silicone Insulated Cable Practice
by H. T. Armitt 978

The Program of The Annual Convention of the Wire Association 982-985

Aspects and Advantages of Training in the Wire Industry
by H. Armitage 988

Status of Polymonochlorotrifluoroethylene Insulated Wire
by L. A. Walters 992

Government Wire Production Information 995

Outstanding Personalities of the Wire Industry 1002

A Review of Recent Wire Patents 1013

Index to Advertisers 1040

Where-to-Buy 1041-1044

WIRE and WIRE PRODUCTS is indexed regularly by Engineering Index, Inc., New York, N. Y.

RICHARD E. BROWN. President and Publisher

R. S. Spengel, Secy.-Treas. & Gen'l. Manager
J. Edward Donnellan, Vice-President

Edmund D. Sickels, Editor

— ASSOCIATE EDITORS —
Lancaster, Allwine & Rommel, Consultants on Patent Information

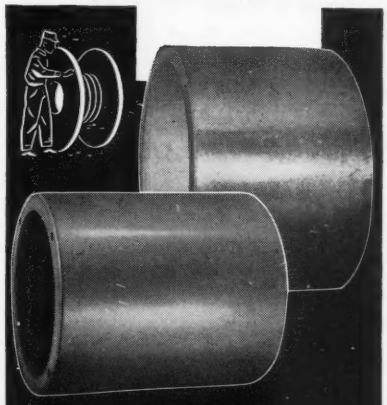
Publication Office: Jersey City, N. J.
Executive Office: 453 Main St., Stamford, Conn.
*Reg. U. S. Pat. Off.

WIRE & WIRE PRODUCTS, Vol. 29, No. 9, September, 1954. Publication Office at One Sherman Avenue, Jersey City, N. J. Executive Office 453 Main Street, Stamford, Conn. Published monthly by the Quinn-Brown Publishing Corp., Richard E. Brown, President; R. S. Spengel, Sec'y and Treas. Subscription Price: U. S. $8.00; Canada, $8.00 per year; Domestic 75 cents per copy; Foreign 90 cents per copy, except October Convention Issue and January Proceedings Issue, $1.25 per copy; Foreign $10.50 per year. Entered as second class matter at the Post Office, Jersey City, N. J. under the act of March 3, 1879.

Copyright, 1954 Quinn-Brown Publishing Corp.

Scott Printing Company, Jersey City 7, New Jersey

SIMPLE
4 STEP
ASSEMBLY
For Wire and Cable Reels



with Republic
FLANGED STEEL
TRAVERSES

It's as easy as this:

1. Insert bolts through wooden head
2. Lay wooden head flat on floor
3. Place traverse in position
4. Fasten second wooden head in place

● No special tools—no experience necessary. Your reels will last for years—and save money.

Made in sizes up to 56-inch diameter and 48-inch traverse—in plain, painted or hot dip galvanized finish—as light as 18-gauge steel. Width of flange and number of bolt and drain holes furnished to your specifications. Available for prompt delivery. Write for prices.

* * *

Manufactured under license arrangement with Western Electric Co., Inc.

REPUBLIC STEEL

REPUBLIC STEEL CORPORATION
Pressed Steel Division • Niles, Ohio
GENERAL OFFICES • CLEVELAND 1, OHIO
Export Dept.: Chrysler Building, New York 17, New York

Story of a gal who couldn't cook

(or why use ELGIN Diamond)

When Susie walked down the street strange things happened. Men winked, wives frowned, cops whistled and cabbies tooted. Susie was a dish—charm in carload lots—sweet but shrewd, lovable but aloof.

As nature would have it, all the boys loved Susie and Susie loved the boys . . . especially when boys meant diamonds. This went on at a mad, happy pace until one sunny day Susie met Herbert. Right then and there, Susie knew that Herbert was for her. But, alas and alack, Herbert just couldn't see Susie. He couldn't—that is—until Susie had him over for dinner one night. Now, kitchen duty just wasn't Susie's strong suit. But, wily as she was, Susie changed her ways . . . made the cutest little ready-mix, no-mistake cake you ever did see. That did it . . . the crack in Herbert's armor was food. Herbert loved food. Herbert went simply c-r-a-z-y over food. Ah, glorious Waterloo . . . Herbert was hooked.

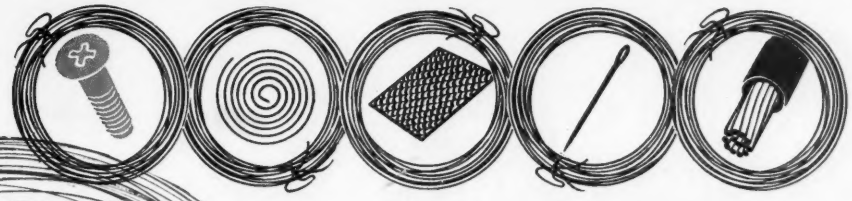
A foul deed you say? No! In this day and age, lots of things are ready-mixed and if a girl—*or anyone*—can use them to advantage . . . why not? Fact of the matter is, you're just as likely to find a ready-mixed product on the workbenches of industry as you are on the pantry shelf at home.

And that about tells the story of Elgin Diamond. For you see—Elgin Diamond is a ready-mixed abrasive which means there's no mixing or grading, no waste or error. And with Elgin's exclusive way of permanently suspending diamond particles in a specially formulated, color-identified vehicle—you get consistent polishing quality, too.

If you haven't already discovered what a wonderful product Elgin Diamond is, you certainly owe it to yourself to try it.

ELGIN NATIONAL WATCH COMPANY

ABRASIVES DIVISION ELGIN, ILLINOIS, Dept. G



CRUCIBLE FINE STAINLESS WIRE...

now available — all sizes... all tempers

Users of fine wire can now obtain prompt delivery of Crucible stainless steel wire... in all diameters... in all tempers from full hard to dead soft. And Crucible's fine wire comes in all standard grades — with a bright surface or a variety of metallic and nonmetallic finishes tailored to meet your specific application.

Our new fine wire mill is equipped with the latest facilities for annealing, pickling, drawing and finishing. Our mill metallurgical control setup is the latest word, too, to assure you that every spool and coil produced conforms to Crucible's high standard of quality — dimensional, physical and surface uniformity that is unsurpassed in the industry.

No matter what type of wire you use — whether it be cold heading wire, weaving wire, spring wire, needle wire, screen wire, cable wire, or a host of other types — our new mill is equipped to serve you. For prompt delivery of quality stainless wire, call your nearest Crucible warehouse.

CRUCIBLE first name in special purpose steels

54 years of Fine steelmaking

STAINLESS STEEL WIRE

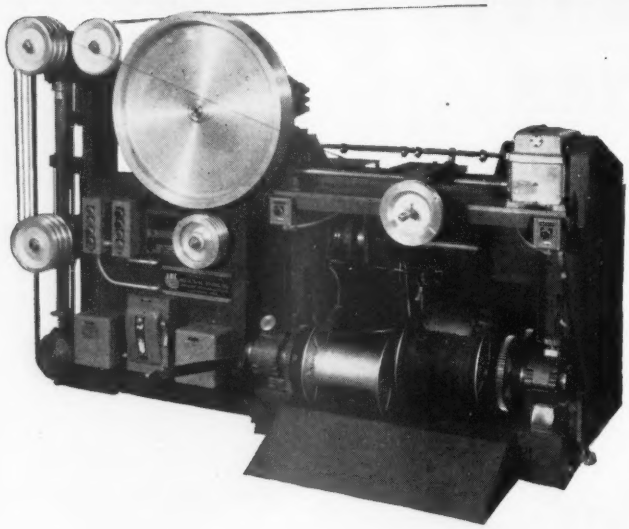
CRUCIBLE STEEL COMPANY OF AMERICA, GENERAL SALES OFFICES, OLIVER BUILDING, PITTSBURGH, PA.

REX HIGH SPEED • TOOL • REZISTAL STAINLESS • MAX-EL • ALLOY • SPECIAL PURPOSE STEELS

INTRODUCING

INDUSTRY'S NEWEST_____
MOST ADVANCED_____
MOST ECONOMICAL TOOL_____

Takeup Unit with Integral Capstan and Constant Tension Reel Drive



1st for UTILITY... Because of rugged construction, ease of control, plus high availability resulting from low maintenance requirements.

1st for DESIGN... Because of superior, exclusive features provided by IOI, it is self-contained—there is no need for other equipment for propelling or winding the wire or handling the reels.

Write or wire for an analysis of how you can profit by using IOI designed machines in your business today.

INDUSTRIAL IOI ENGINEERING VERSATILITY **OVENS, INC.**

13807 TRISKETT ROAD CLEVELAND 11, OHIO

IOI Builds Better Equipment

THE BEELINE WIRE DRAWING MACHINE

Straight-line type Wire Drawing Machine for high-speed production of all wire grades

This picture shows a Beeline DG 4 built for an inlet wire diameter of about 7 mm (approx. 2 SWG). High carbon steel.

Prominent Beeline features:

- Complete absence of slipping between wire and block.
- Direct block-to-block wire running, with automatic speed control and no loops or other mechanical adjusting devices.
- Continuous speed adjustment from almost zero up to maximum.

Let us help you solve your problems. We shall be glad to answer your questions promptly. Don't forget to let us know what wire is to be drawn, the inlet and finished diameter, its intended use, the production required, and all other relevant information (tensile strength of the finished wire etc.). Then we can suggest a machine that is just right for you.

The machine is at present manufactured in three different sizes:

BEELINE DG 5:
for heavy wire, about 13 mm. (7/0 SWG)

BEELINE DG 4:
for wire rods, about 7 mm. (2 SWG)

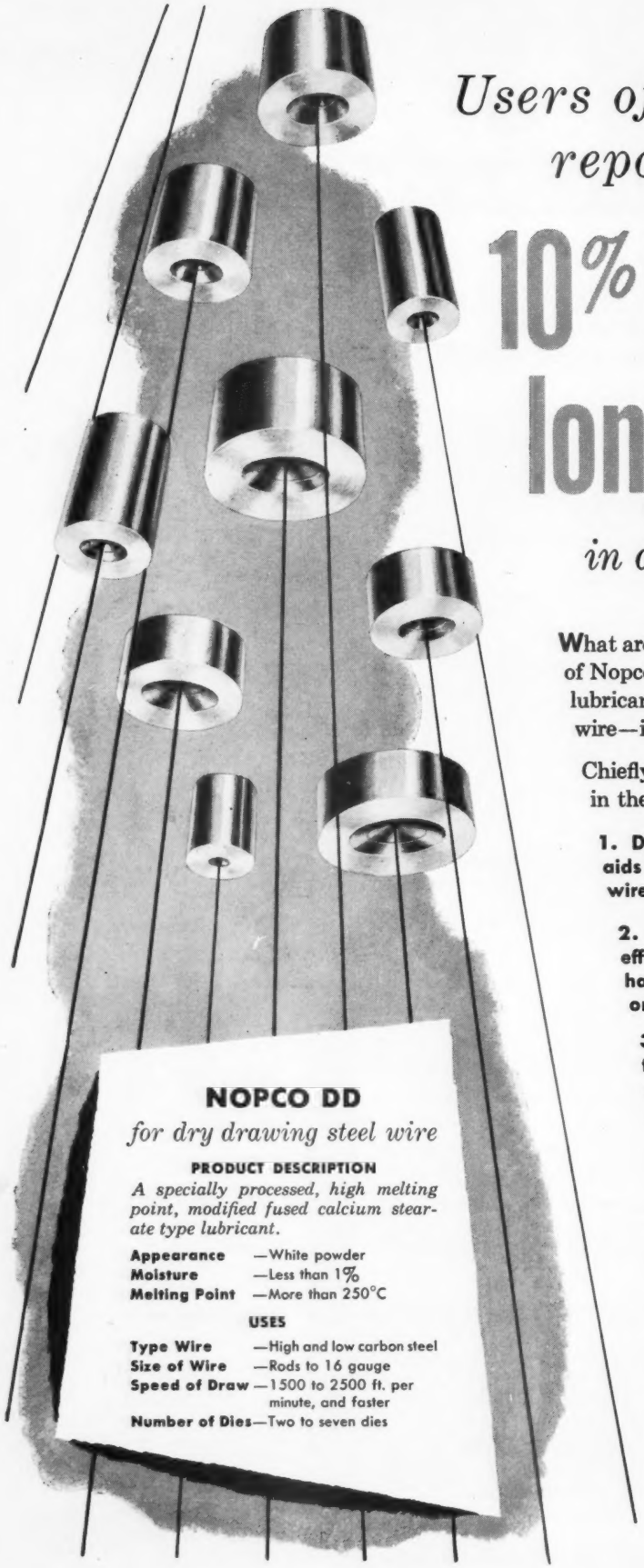
BEELINE DM 3:
for wire with an inlet diameter of about 3 mm. (11 SWG)

MH

MORGÅRDSHAMMAR

MORGÅRDSHAMMARS MEK VERKSTADS AB • MORGÅRDSHAMMAR • SWEDEN

Cables: Morgårdshammar, Ludvika. Tele: 0240–71100



Users of **NOPCO® DD** *report:*

10% to 50% longer die life

in dry drawing steel wire

What are the reasons why Nopco DD, recent product of Nopco research, is almost certainly superior to the lubricant you are now using for dry drawing steel wire—including galvanized or plated wire?

Chiefly, because it excels all other lubricants in these 3 ways:

1. **DD's specially processed calcium stearate base aids in surface tension—makes the soap stick to the wire all the way through the drawing process.**

2. **DD's soft film of combined coating and soap effectively separates wire and die—as compared to harsher soaps which have an abrasive action on the die.**

3. **Perhaps most important of all, because the melting point of DD is over 250°C. It does not "burn out" and lose effectiveness like other low melting point soaps often used.**

Though Nopco DD has been available only a year, plant after plant has adopted it—strictly as a result of its performance in their own comparative tests. Isn't it high time *you* tried it? We'll gladly help by furnishing full information and samples for testing. Write today.

NOPCO DD

for dry drawing steel wire

PRODUCT DESCRIPTION

A specially processed, high melting point, modified fused calcium stearate type lubricant.

Appearance	—White powder
Moisture	—Less than 1%
Melting Point	—More than 250°C

USES

Type Wire	—High and low carbon steel
Size of Wire	—Rods to 16 gauge
Speed of Draw	—1500 to 2500 ft. per minute, and faster
Number of Dies	—Two to seven dies

NOPCO CHEMICAL COMPANY

Harrison, New Jersey

Cedartown, Ga. • Richmond, Calif.

NOPCO TRADEMARK EVOLVED THRU RESEARCH

completely MODERN in our methods!

MODERN . . . EFFICIENT . . . Yard Equipment . . . facilitates transportation of RAW MATERIALS from STORAGE to PRODUCTION DEPARTMENTS . . . where skilled

Craftsmen . . . with the assistance of the FINEST in Automatic Wood Working Machinery construct WOOD REELS of the BEST quality in the Industry today.

THE ABOVE...
PLUS
is our answer to your most exacting SPECIFICATIONS
for WOOD REELS...
for CABLE · ROPE · WIRE

HIGH SPEED
SHIPPING SERVICE in our... OWN TRUCKS
within a radius of 200 miles from the plant. Fast freight will bring you Bridge reels in 5 days or less east of the Mississippi.

BRIDGE
MANUFACTURING COMPANY
HAZARDVILLE, CONNECTICUT
Telephone . . .
Thompsonville, Connecticut
Riverview 9-8308

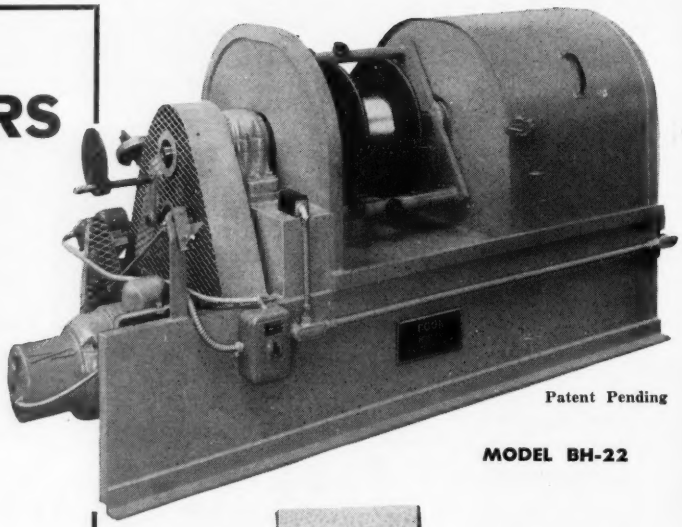
"REAL GOOD . . .
Let us quote on your reel needs. Send your specifications. Better yet, visit our plant and see how and why our reels are made so well at so low a cost.
WOOD REELS"

you don't send a boy to do a man's job....

why try to meet modern competition with obsolete, inadequate machines?

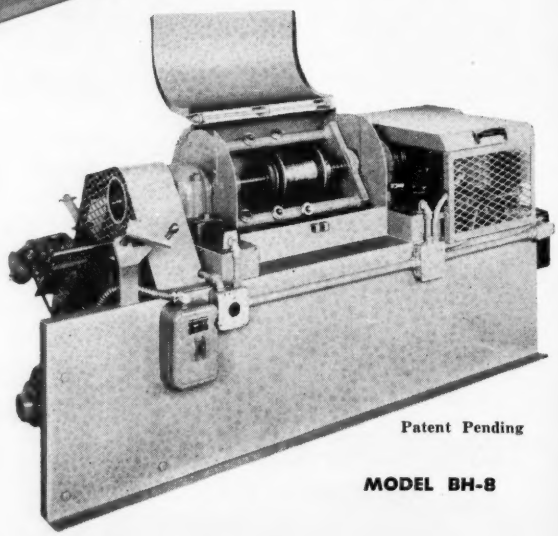
COOK BUNCHERS
give you high speed bunching with perfect concentricity and smoothness

- ***don't just "meet" competition— BEAT competition... by producing at a profit.***



Patent Pending

MODEL BH-22



Patent Pending

MODEL BH-8

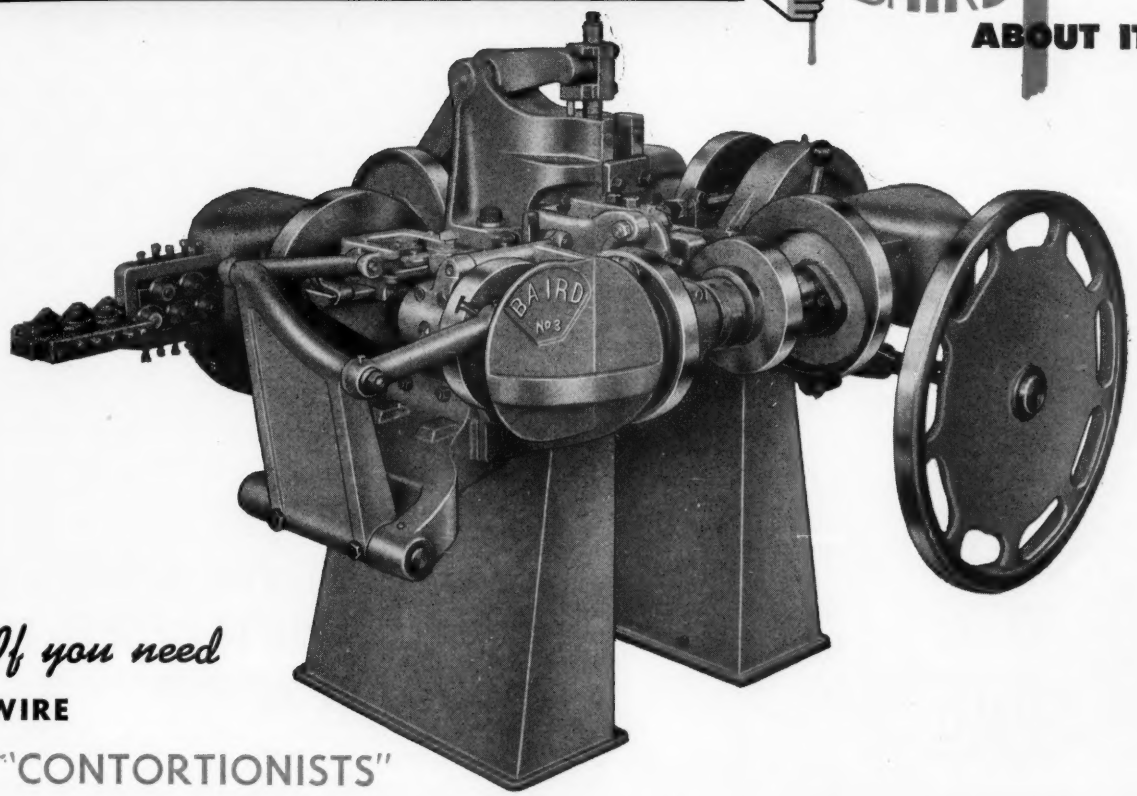
"LOOK TO COOK"

COOK MANUFACTURING COMPANY

50 East 25th Street • Paterson, New Jersey • Telephone: Armory 4-6380

. . . IF IT'S A HIGH PRODUCTION PROBLEM . . .

ASK BAIRD ABOUT IT



If you need

WIRE

"CONTORTIONISTS"

The BAIRD FOUR-SLIDE is your FORMING MACHINE

There is probably no machine in the world that can make a greater variety of parts . . . or produce them any faster . . . than the Baird Four-Slide. It seems that there must be a limit to the fashioning of small wire and metal ribbon products *by hand* . . . and then tooling a Baird Machine to make them *automatically.* Yet, new shapes are continuously submitted to us . . . and we still find the solutions.

Taking coiled wire from a reel, the machine straightens, feeds, and cuts off the required length . . . then forms and ejects the part. Different sizes of standard machines give you a selection of wire lengths to 32½" . . . dia. to ½" or flat ribbon metal products to 1½" wide. Special attachments such as *secondary cut-offs, lettering, form raising, pin pulling, nail pointing, vertical forming and stripping, ring setting, etc.,* extend the versatility of operations.

Thus you may purchase your machines for specific repetitive production, then, at any time, add special attachments as your production requirements indicate. At all times you may count on Baird engineers for development of tooling from your parts or specifications.

This is your profit-making machine. Send for the Baird Four-Slide Bulletin.

ZBA54

THE BAIRD MACHINE COMPANY

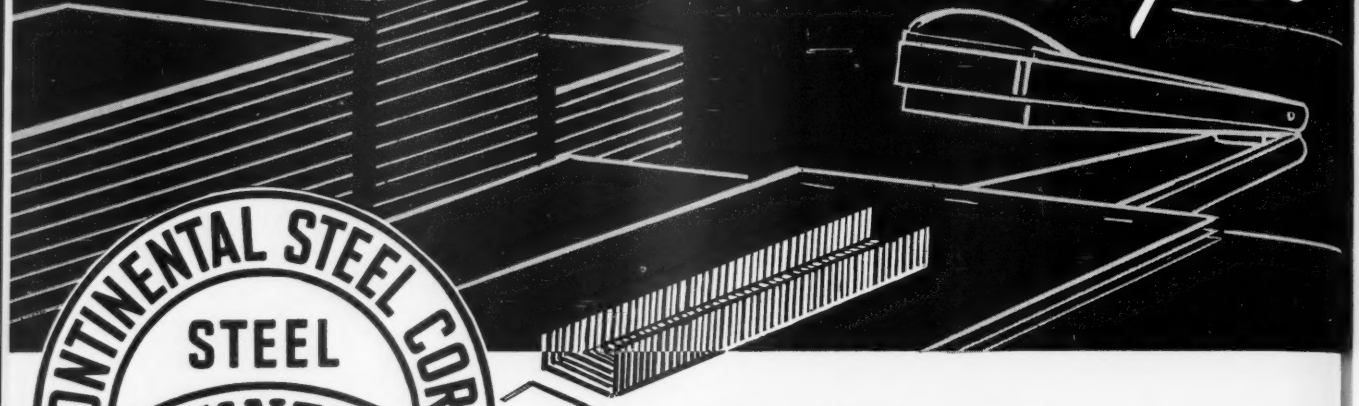
STRATFORD CONNECTICUT

WHERE YOU WILL GET THE HELP OF SPECIALISTS ON THESE ESSENTIAL PRODUCTION PROBLEMS:

AUTOMATIC MACHINE TOOLS • AUTOMATIC WIRE & RIBBON METAL FORMING MACHINES • AUTOMATIC PRESSES • TUMBLING BARRELS

DESK JOBS CAN BE TOUGH

...On wire staples



CONTINENTAL STEEL CORP.
STEEL
CONTINENTAL
REG. U.S. PAT. OFF
WIRE
KOKOMO, IND.

SOLVE PRODUCT TRIM OR PARTS PROBLEMS WITH CONTINENTAL'S SHAPED WIRE

Many Continental wire customers save money, add sales appeal to their products by using the right shaped wire for basic parts or exterior trim. Providing wire in special shapes is another Continental service for its customers.

ROUND OR FLAT CONTINENTAL'S PREFORMED STAPLE WIRE IS GEARED FOR PLENTY OF ACTION

Your best guarantee that the staple wire you need has the desired degree of stiffness or meets any other particular wire requirement is to let Continental apply real application engineering to your problem. The fact that Continental wire must be right for your particular product application—for it's made right . . is no idle boast, but a basic Continental policy. This policy has been established over a half century of wire making and applies to wire for preformed staples, as well as wire for thousands of other applications in practically any size, temper, finish, shape or analysis—in low carbon and medium low carbon steels. Take advantage of Continental's wire service. Phone, write or wire us at Kokomo.

CONTINENTAL STEEL

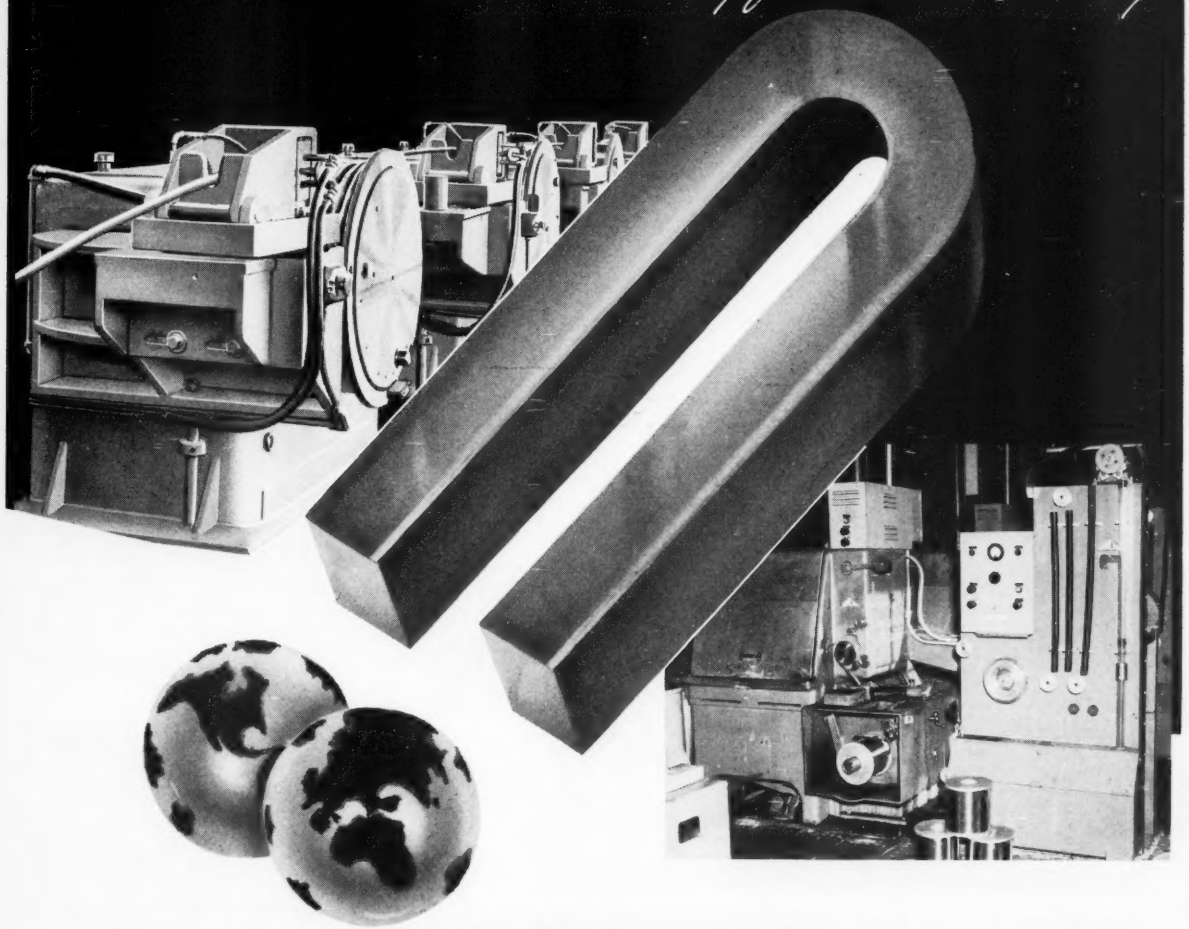
CONTINENTAL STEEL CORPORATION

GENERAL OFFICES • KOKOMO INDIANA

PRODUCERS OF Manufacturer's Wire in many sizes, shapes tempers and finishes, including Galvanized, KOKOTE, Flame-Sealed, Coppered, Tinned, Annealed, Liquor Finished, Bright, Lead Coated, and special wire. ALSO, Coated and Uncoated Steel Sheets, Continental Chain Link Fence, and other

SYNCRO

Better Machinery for the Wire Industry



attracting "WORLD WIDE" interest!

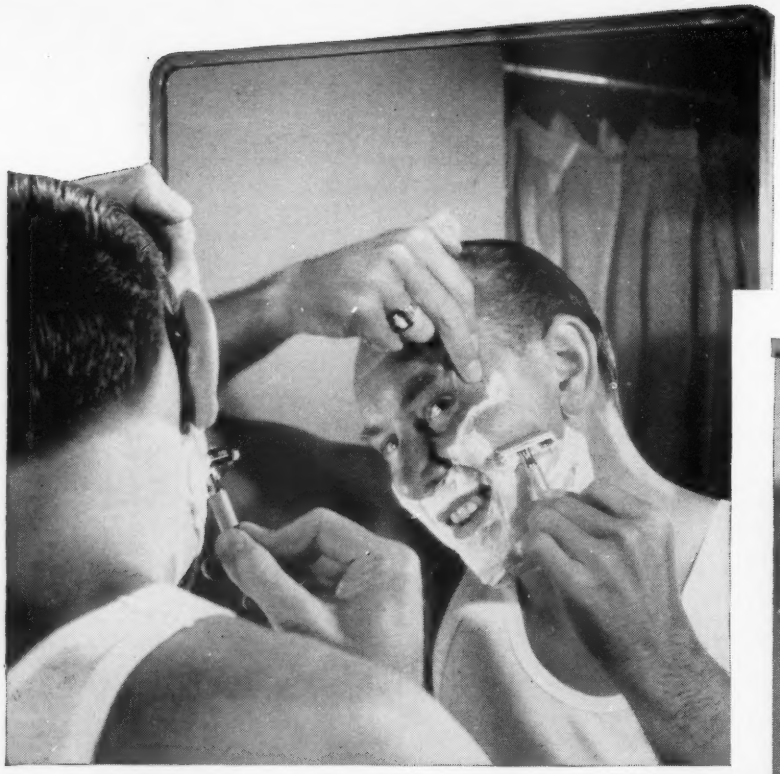
- WIRE DRAWING MACHINES
- CONTINUOUS ELECTRIC ANNEALERS
- HEAVY DUTY TAKE-UPS
- WIRE INSULATORS
- STRANDERS
- DIE STRINGERS
- TAPERS
- PAYOFFS
- SPECIAL MACHINERY

with a completely modern line of HIGH SPEED wire processing machinery.
Our EXPERIENCE, ENGINEERING ability and PRODUCTION facilities are at your service. We would be pleased to be of assistance.

SYNCRO MACHINE COMPANY • PERTH AMBOY • NEW JERSEY • USA

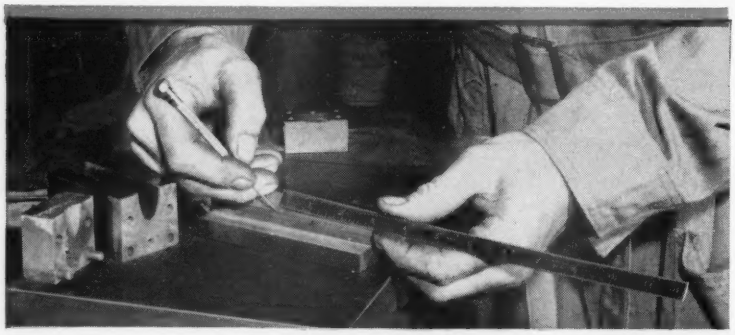
Affiliated Company WINGET-SYNCRO, LTD • ROCHESTER • KENT • ENGLAND

You can get for any of



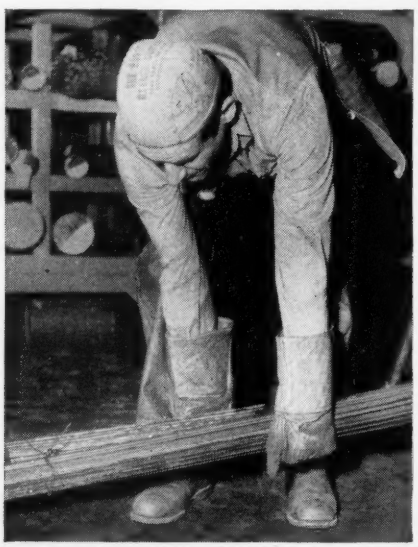
Blades Stay Sharp. Special precautions are taken with Amerstrip Razor Blade Steel to see that it is *clean* and free of impurities, to see that it won't chip or nick when honed. This special alloy steel takes a good sharp edge that *stays* sharp, shave after shave.

Hand or Band Saws. Amerstrip Saw Steel is hard, strong, durable, and flexible—just what you need in saws. The steel is free of defects, ready for toothing and cutting to length. Available for wood or steel saws.



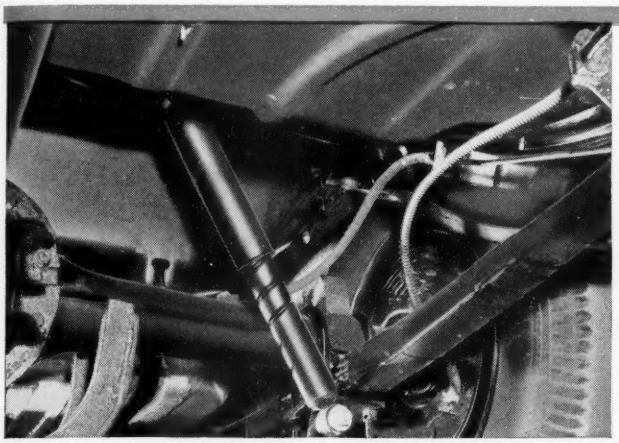
Straight and Flat is the Rule. Camber and flatness are closely controlled in Amerstrip Rule Steel to insure accuracy. This steel is available tempered or untempered, cut or coiled, in a wide range of sizes.

Amerstrip is a Staple. Amerstrip Staple Wire is hard rolled for good penetration, and it folds without cracking. Clean and bright, it is galvanized to resist corrosion. A wide range of sizes to fit many uses.

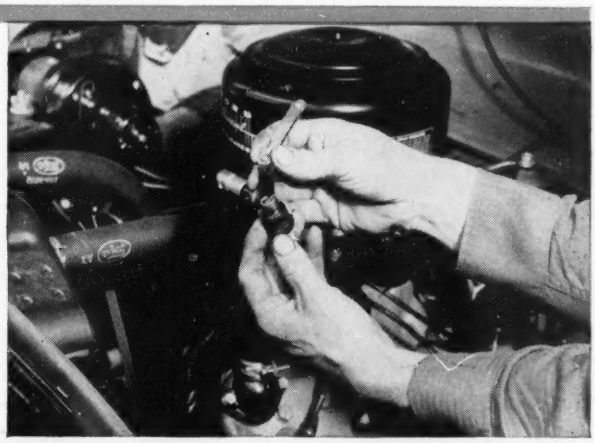


Toe Saver. Amerstrip Toe Cap Steel is used extensively to reinforce the toes of safety shoes. It is high carbon steel, furnished in coils with a #3 edge, ready for stamping.

high quality Amerstrip these specialty products

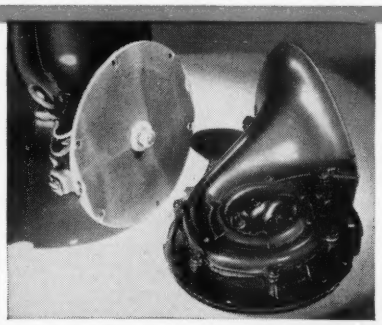


De-Jolting Mechanism. In automobile shock absorbers, discs of Amerstrip help to regulate the flow of oil to cushion bumps and jolts. Close attention is paid to temper and flatness to lengthen fatigue life.

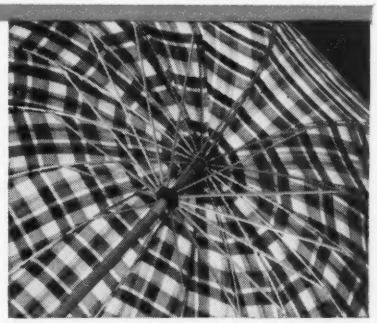


For Measuring Thousandths. Amerstrip Feeler Gauge Steel is extremely flat, uniform, and rolled to close tolerances. It is available with a #1 edge, bright tempered, in thicknesses from .0015" to.025".

For Stopping Stuck Shades. High carbon Amerstrip Curtain Spring Wire assures good strong winding action on window shades, portable projection screens, schoolroom maps, and similar products. In coils, in all standard sizes.



High Honking Power. Only a flat, scaleless, tempered high carbon strip can withstand the high stresses and fatigue encountered in automobile horn diaphragms. Amerstrip Diaphragm Steel is made especially for this tough job.



Bumbershoots. Amerstrip Umbrella Wire is used in ribs and bows of umbrellas. It is straight, formable, and smooth. Special sizes of this high carbon annealed wire are stocked. Every phase of manufacture is controlled closely.

FOR MORE INFORMATION— ***Write your nearest American Steel & Wire sales office.***

AMERICAN STEEL & WIRE DIVISION, UNITED STATES STEEL CORPORATION
GENERAL OFFICES: CLEVELAND, OHIO

COLUMBIA-GENEVA STEEL DIVISION, SAN FRANCISCO, PACIFIC COAST DISTRIBUTORS
TENNESSEE COAL & IRON DIVISION, FAIRFIELD, ALA., SOUTHERN DISTRIBUTORS
UNITED STATES STEEL EXPORT COMPANY, NEW YORK

Amerstrip

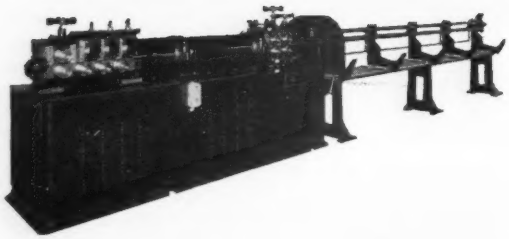
CARBON • ALLOY USS STAINLESS

UNITED STATES STEEL

NOW - DUAL CONTROL!

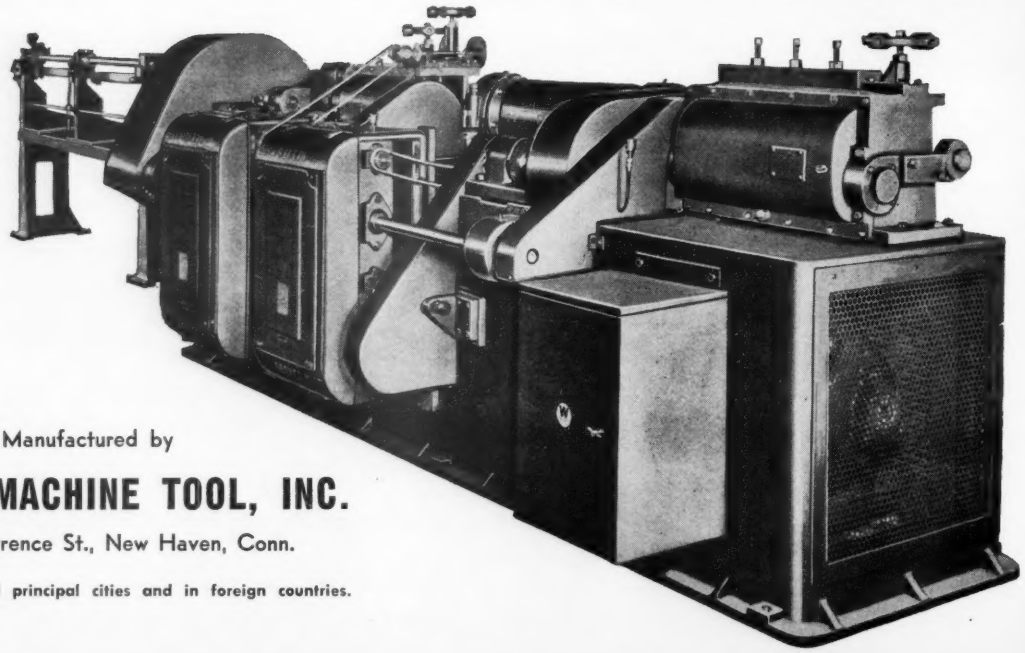
Both the speed of feed, and the speed of cut off are individually controlled by separate variable speed units on each of these new SHUSTER automatic wire straighteners and cut off machines.

SHUSTER *Since 1866*



3 AV & 4 AV *Automatic*
WIRE STRAIGHTENERS & CUT OFF MACHINES
with INFINITE SPEEDS

No. 3AV handles wire 1/2" dia. max.; 4AV will take 11/16" max. Of all SHUSTER machines built since 1866, we feel these are the best yet. Write for Bulletin 37V and get the complete story.



Manufactured by

METTLER MACHINE TOOL, INC.

132 W. Lawrence St., New Haven, Conn.

Representatives in all principal cities and in foreign countries.

SHUSTER *Automatic* — *Since 1866* — WIRE STRAIGHTENING AND CUTTING MACHINES

NATIONAL

WIRE

(COLD ROLLED)

in Coils or Straight Lengths

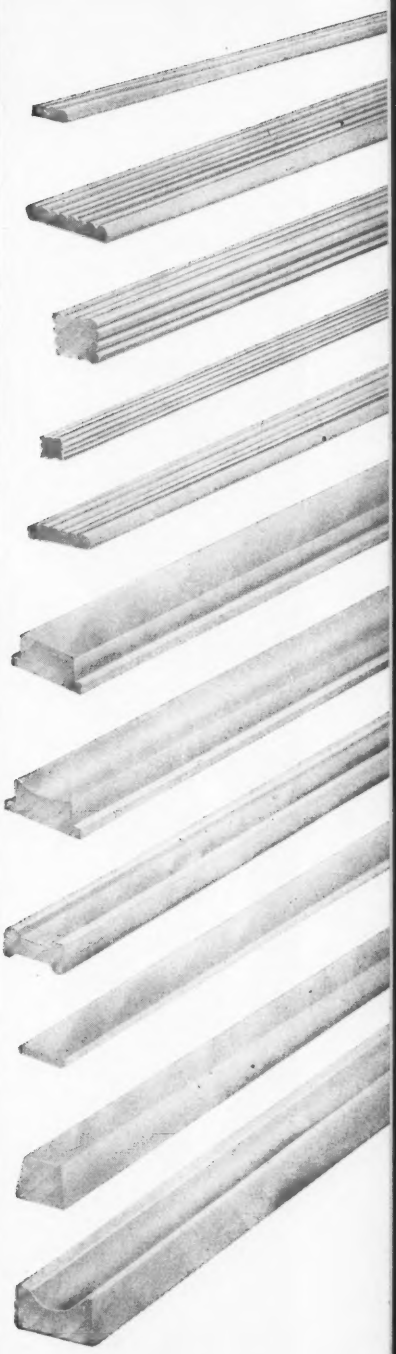
COMPLETE METALLURGICAL SERVICE

Manufacturers of

SPRING WASHERS	RETAINING RINGS
ROUND EDGE FLAT WIRE	KEYSTONE SHAPED WIRE
SQUARE EDGE FLAT WIRE	SPECIAL SHAPED WIRE

Shaped Wire in Coils or Straight Lengths, Ferrous or Non-Ferrous.

LARGE OR SMALL QUANTITIES



Manufactured by

THE NATIONAL LOCK WASHER COMPANY

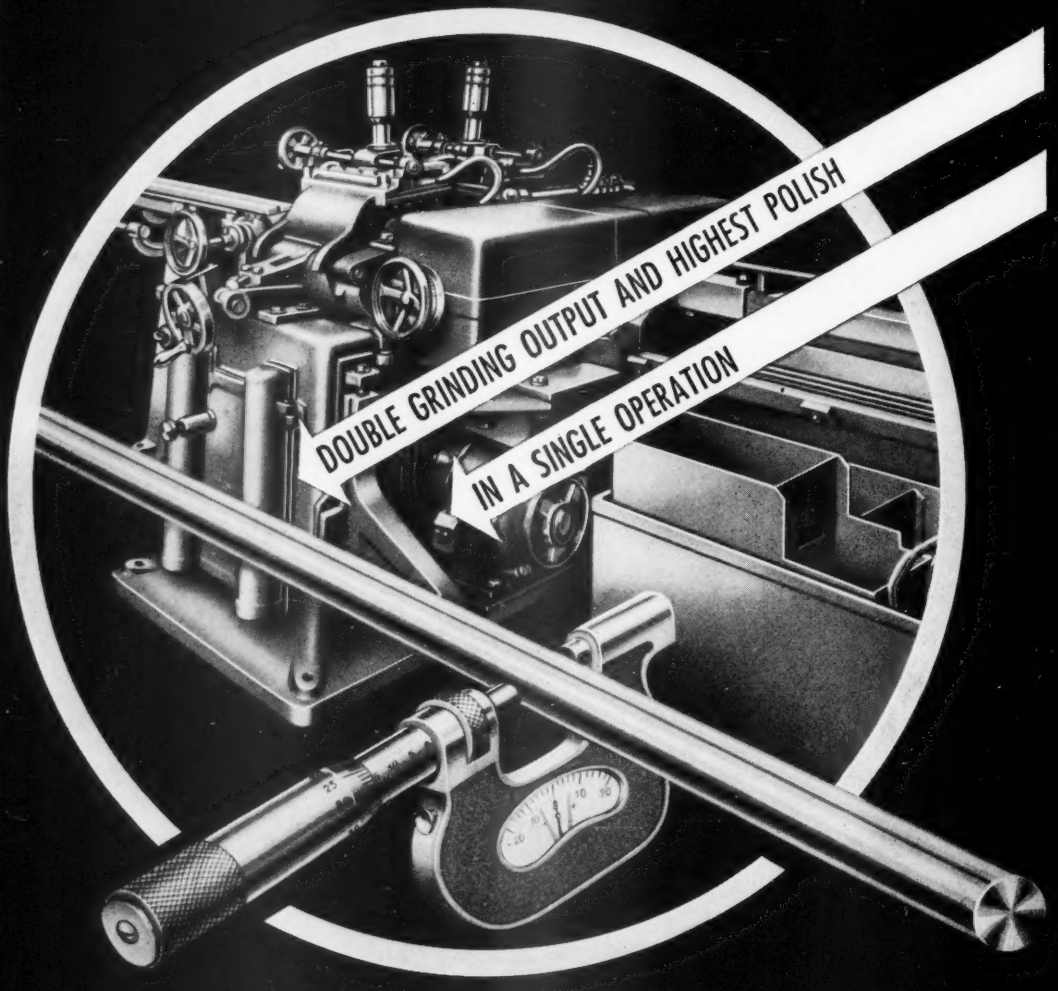
PRECISION SHAPED WIRE DIVISION

NEWARK 5, N. J. MILWAUKEE 2, WIS. U.S.A.

SCHUMAG AACHEN

GRAPHIK JUPP KUCKARTZ

CENTERLESS BAR GRINDING AND POLISHING MACHINE



EXCLUSIVE REPRESENTATIVES FOR USA, CANADA & MEXICO:

American Laubscher Corp.,
333 West 52nd Street, New York 19, N.Y.

The Best is Cheapest

in the long run!

USE

"America's Finest Wire Drawing Lubricants"

MAY WE HELP YOU?

SERVICE CENTERS

JOHN A. MORITZ, Pres., 4600 W. Ferdinand St., Chicago 44, Illinois.

EARL BOWERS, Vice Pres., 66 Dolphin Drive, St. Petersburg 6, Florida.

GREY VERNER, Tech. Dir., 4600 W. Ferdinand St., Chicago 44, Illinois.

ROBERT L. BARTON, 3249 Roanoke Rd., Kansas City 8, Missouri.

ARTHUR J. O'MARA, c/o Standard Industrial Compounds Co., Millbury, Mass.

BRUCE SIEMON, 2400 Morrow Place, Pittsburgh 34, Pennsylvania.

KENT BOSWORTH, 416 Manhatten Road, Joliet, Illinois.

NEW "REDCOAT" A "NEW COMPOUND FOR THE ELECTRO-CHEMICAL DEPOSITION OF COPPER TO STEEL"

Standard Industrial has pioneered in most of the outstanding contributions to better wire drawing through better lubricants. Consult Standard Industrial for the solution of your difficult problems.

Standard Industrial

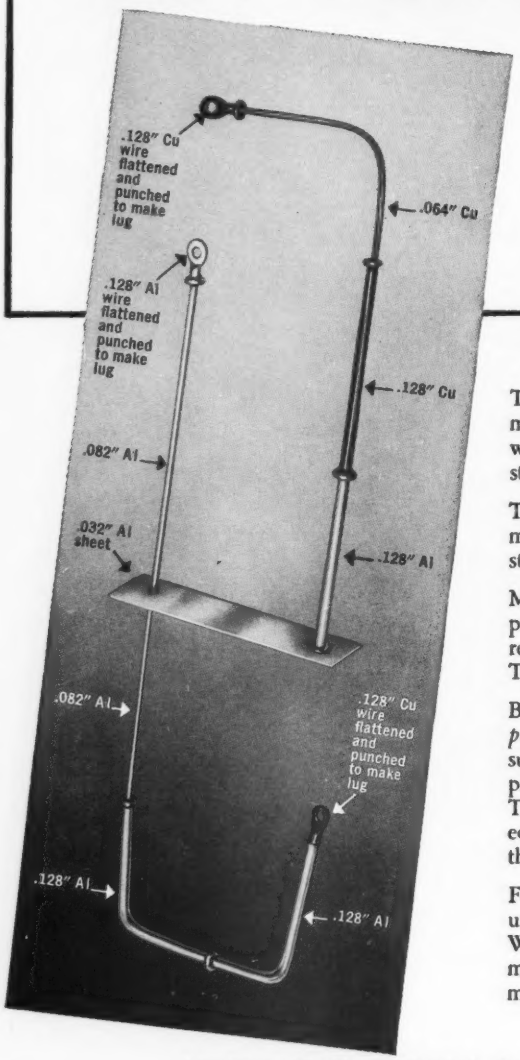
COMPOUNDS CO., INC.
4600 WEST FERDINAND STREET
CHICAGO 44, ILLINOIS

TELEPHONES: Mansfield 6-9324-5-6

GET PERFECT WELDS

without heat, electricity or chemicals

in just seconds!


.128" Cu wire flattened and punched to make lug
.064" Cu
.128" Al wire flattened and punched to make lug
.128" Cu
.082" Al
.032" Al sheet
.128" Al
.082" Al
.128" Cu wire flattened and punched to make lug
.128" Al
.128" Al

This new and perfected process buttwelds through pressure *alone*—the metal is pressed together between specially designed dies. UTICA Koldwelding is so easy and foolproof that even unskilled workers of average strength can make perfect welds in just seconds.

They're real *welds*, too—not just bonds! Actual inter-molecular flow of metal occurs. Tests show Koldwelds have 95% to over 100% the tensile strength of the parent wire.

More than that, the inter-molecular connection results in an electrically perfect splice. No flux, second metal or alloy is present at weld. Electrical resistance will not change because of oxide films, corrosion, moisture, etc. There is no change in wire diameter—and flash is easy to remove.

Buttwelding is done with a hand tool 14" long, *weighing only five pounds!* Each UTICA KOLDWELDING tool is supplied with lightweight carrying case and precision dies to fit the user's specific needs. This UTICA tool with its dies is the total equipment needed for Koldwelding out in the field or in the production line!

For further information, please write telling us as much as possible about your application. We should know the sizes and grades of metals to be welded and other pertinent information.

WELDS UNLIKE METALS!

Many difficult wire welding jobs can be accomplished easily with UTICA Koldwelding equipment. The process buttwelds various non-ferrous metals such as aluminum, hard and soft electrical copper, platinum, silver and other metals—welding the same or unlike metals together . . . such as aluminum to copper, etc. Also easily welds different gauges of wire together. Flash is easily removed with fingers or small pliers. Wire may be drawn after Koldwelding and tests show it will part at some point remote from the Koldweld. Typical wire mill tests have drawn Koldwelded .164 aluminum wire down to .019 at high speed—with fifteen Koldwelds in a 25-foot length. There were no breaks, no identification of Koldwelded joints after drawing.

Made by UTICA—*producers of 86 types of pliers, most in several sizes . . . and other fine forged tools.*

UTICA KOLDWELD

U TI CA ®

DROP FORGE & TOOL CORP., Utica 4, N. Y.

"UTICA", when applying to tools made by Utica Drop Forge & Tool Corp. is a Trade Mark Reg. U. S. Pat. Off.

Youngstown

QUALITY YOUNGSTOWN SERVICE

BRIGHT BASIC WIRE

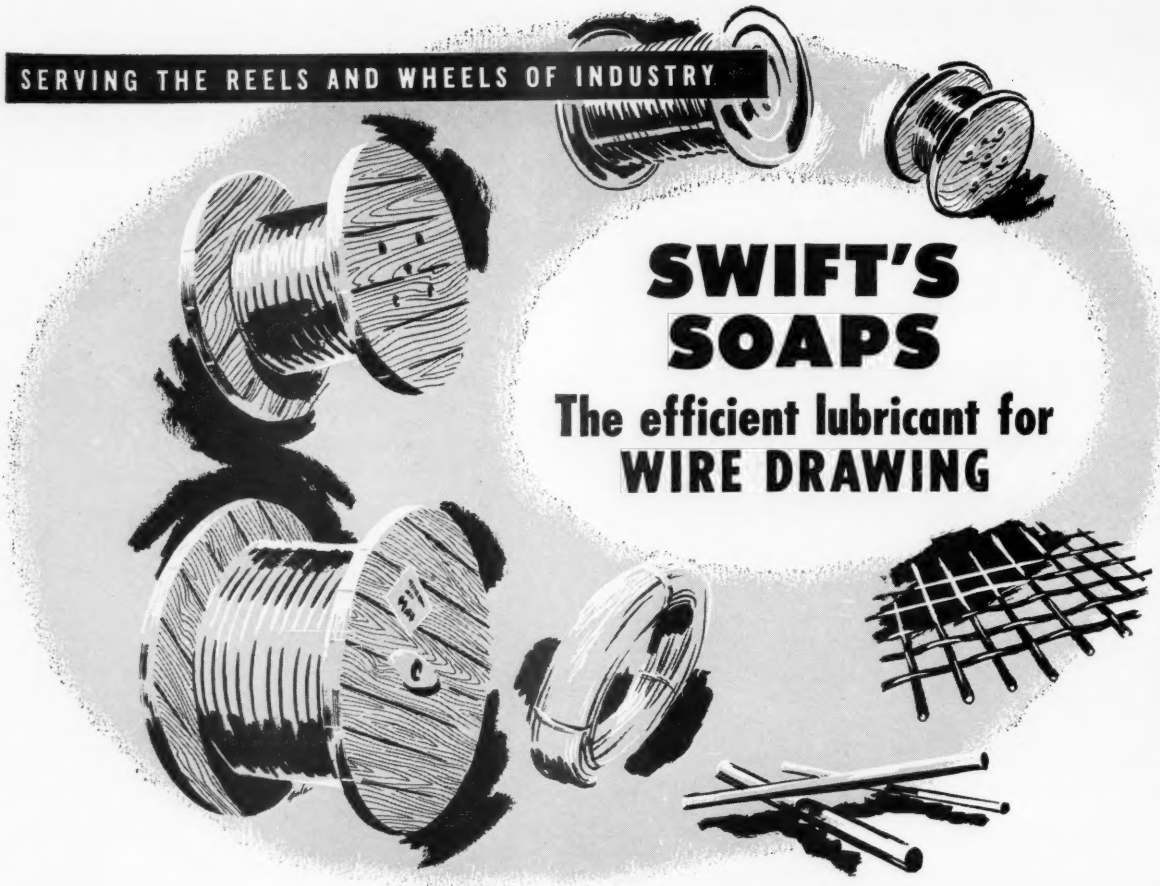
●These coils of Youngstown Bright Basic Wire will soon go to make a thousand and one different shapes. As U bolts, eye bolts, special-shaped rods and handles, Youngstown Wire is formed, crimped, threaded and headed to give you perfect wire products consistently. Make your next wire order Youngstown—the wire from which can be formed many perfect shapes.

THE YOUNGSTOWN SHEET AND TUBE COMPANY *Manufacturers of Carbon, Alloy and Yoloy Steel*

General Offices: Youngstown, Ohio - District Sales Offices in Principal Cities

SHEETS - STRIP - PLATES - STANDARD PIPE - LINE PIPE - OIL COUNTRY TUBULAR GOODS - CONDUIT AND EMT - MECHANICAL TUBING - COLD FINISHED BARS - HOT ROLLED BARS - BAR SHAPES - WIRE - HOT ROLLED RODS - COKE TIN PLATE - ELECTROLYTIC TIN PLATE - RAILROAD TRACK SPIKES

SERVING THE REELS AND WHEELS OF INDUSTRY



SWIFT'S SOAPS

The efficient lubricant for WIRE DRAWING

IMMEDIATE DELIVERY
ON THESE QUALITY SOAPS . . .

- Powdered White Ribbon
- Guaranteed Powder
- Snap Heavy Duty Wire (Drawing Powder No. 282)
- No. 559 Powdered Soap

Call Swift for SOAPS

Another of Swift's Products for Industry

● To best serve today's industrial needs a drawing lubricant must, above all, offer *maximum protection* to metal and dies under increasingly higher operating speeds and stresses.

To meet this need, Swift's line of high quality Industrial Soaps has been continually expanded. New products have been added, old products improved. Swift's service has been broadened, experience and know-how increased.

FAST SERVICE

That's why you can depend on Swift as a *single* source for resourceful service and prompt delivery on a complete line of efficient wire drawing soaps . . . lubricants that are widely depended upon for protection on tough drawing jobs.

Investigate Swift's soaps. There is a distributor near you . . . 375 of them throughout the U.S. and Canada to serve you, in your routine or specialized wire drawing requirements.

ONE TRIAL IS BETTER THAN A THOUSAND CLAIMS

SWIFT & COMPANY
Industrial Soap Department
CHICAGO 9, ILLINOIS

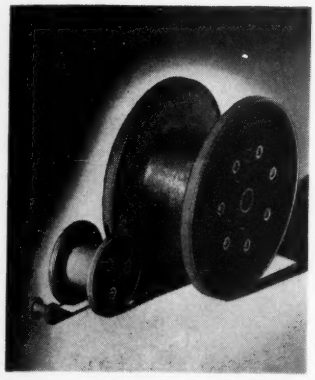
Whatever Your Requirements, Direct Your Inquiries to

HUBBARD—SPOOL and REEL HEADQUARTERS

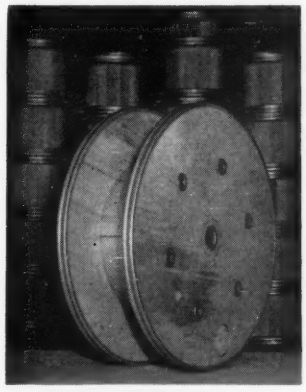
• ONE DEPENDABLE SOURCE FOR ALL TYPES •

SHIPPING • SHOP • STEEL • ALUMINUM • WOOD • PLYWOOD • SPECIAL

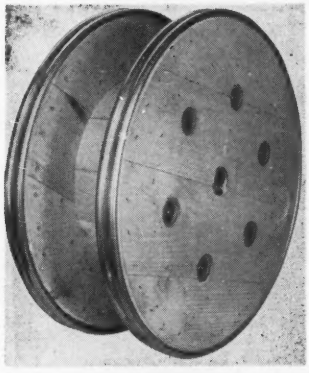
TRAVERSES • FLANGES • CAST • ARBOR PLATES • WASHERS • LAGGING



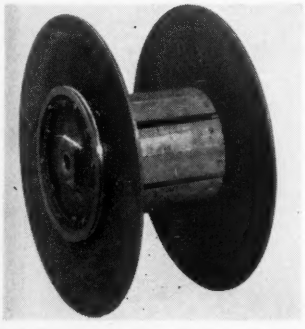
Plywood—Process and Returnable Shipping Reels.



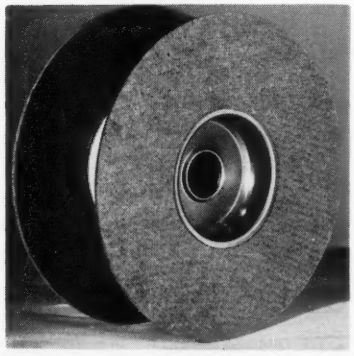
Dimension Lumber for Returnable Reels.



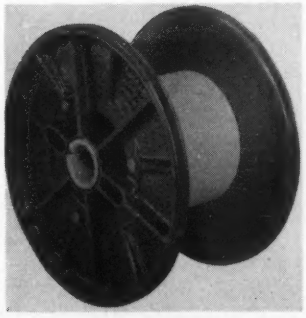
Nailed Reel. Banded for Returnable Types.



Special Reels Made to Your Designs



Reel with masonite flange and cardboard hub assembled with steel end washers for domestic or export shipment of wire, tape, braid or other materials.



Light Alloy Cast Reels for Process & Shipping

The HUBBARD LINE of Spools and Reels includes all types and combinations of constructions for shipping, shop and processing for wire, rope and electric wire and cable, standard or made to your specifications.

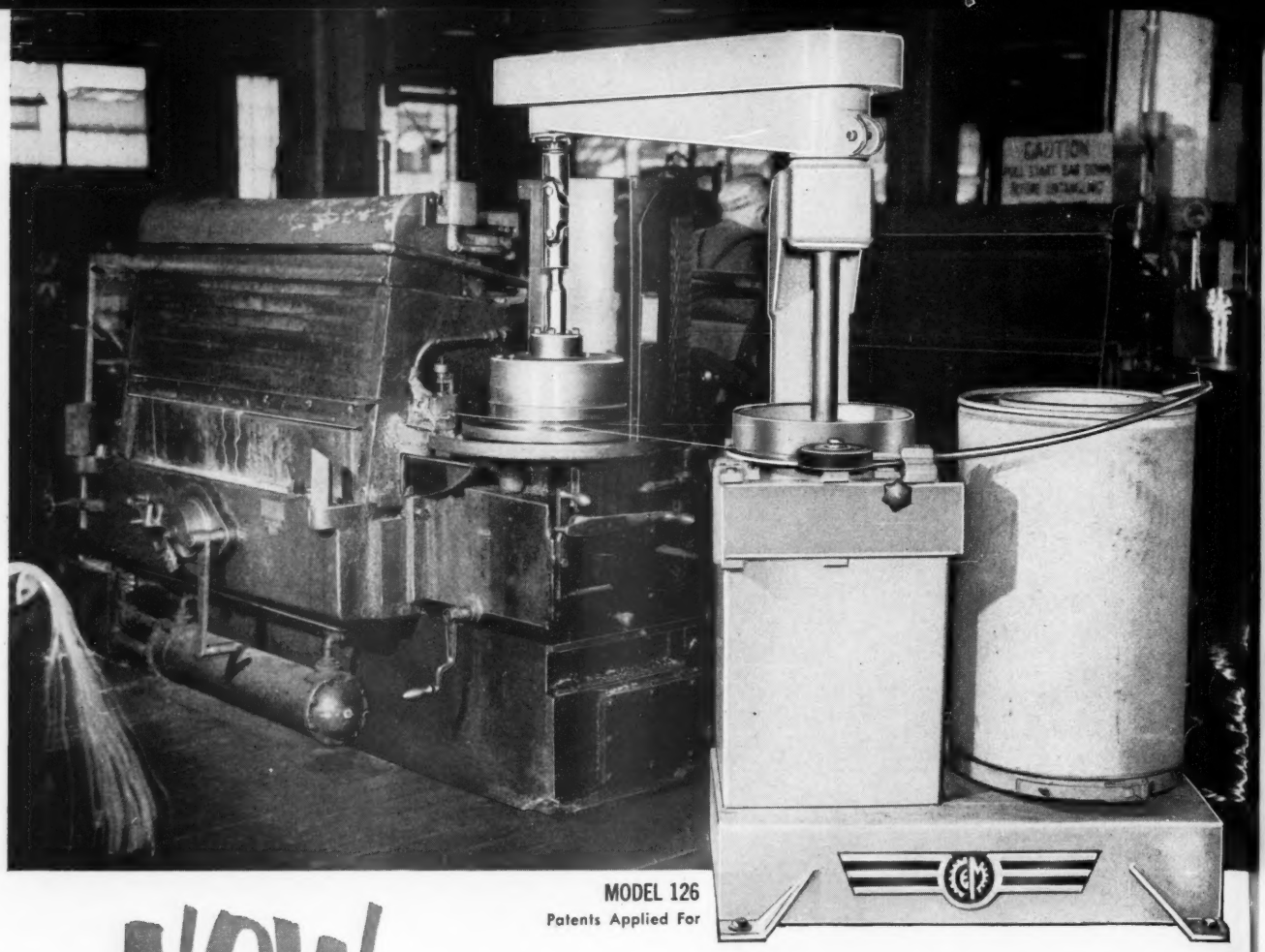
We invite your inquiries.

HUBBARD SPOOL COMPANY

GARRETT • INDIANA

Telephone: 840

"THE BIGGEST NAME IN SPOOLS AND REELS"



MODEL 126
Patents Applied For

NOW - an **attachment** for continuous wire packaging

For the first time you can *adapt your existing machinery* to continuously package wire in fibre containers . . . 600 pounds in each! And it can be done without a large capital expenditure in new equipment. With Coulter & McKenzie Attachments your own machines will *continuously* pour wire into PAYOFFPAKS . . . ready for delivery!

These features make it easy to cash in on the PAYOFFPAK:

SYNCHRONOUS OPERATION through positive Overarm Drive from any vertical or horizontal block.

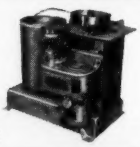
COMPACT DESIGN allowing the Attachment to be located in any one of many positions around your machinery.

CONVENIENT OVERARM disconnects and swings aside for selective return to conventional coil and spool operation.

The Coulter & McKenzie Model 126 Attachments will be built to your specifications.

Write today for the Coulter & McKenzie "Attachment Questionnaire."

MODEL 116



MODEL 128

Other PAYOFFPAK machines are available for continuously drawing (Series 116) or packaging (Series 128) fine or coarse wire. Write today for complete information . . . Kindly state your requirements.

A FULL RANGE OF WIRE FROM SOFT COPPER TO HIGH CARBON, AND FROM .012" TO .250" IS BEING PAYOFFPAKAGED.

Continental Can Company Licensee

771 WATER STREET
OPPOSITE RAILROAD STATION

TELEPHONE EDISON 5-1101
LIEBER'S CODE "MACKENZIE"

THE COULTER & McKENZIE MACHINE CO., INC.

SINCE 1843

BRIDGEPORT 3, CONNECTICUT, U. S. A.

INCORPORATED 1881

SLICKEST TUBE DRAW COMPOUND YET!

For steel, brass, copper...

SHELL CALMA COMPOUND K, a new product of Shell Research, is the economical answer to trouble-free tube drawing in both plug-draws and die-sink operations on steel, copper, brass and aluminum tubing. It remains stable for long periods in high bulk temperature operations.

Calma K gives off no noxious odor or fumes in either neat form or in the emulsion . . . perfectly safe for handling under all plant conditions. It's easy to use. It requires no boiling or cooking . . . simply mix it with hot water from the tap and it's ready for use.

Write on your letterhead for a one-pound sample for your own evaluation.

CHECK ITS ODOR.. CHECK ITS LUBRICITY... CHECK ITS VERSATILITY

SHELL Calma Compound K

SHELL OIL COMPANY

50 WEST 50TH STREET, NEW YORK 20, NEW YORK
100 BUSH STREET, SAN FRANCISCO 6, CALIFORNIA

SHELL

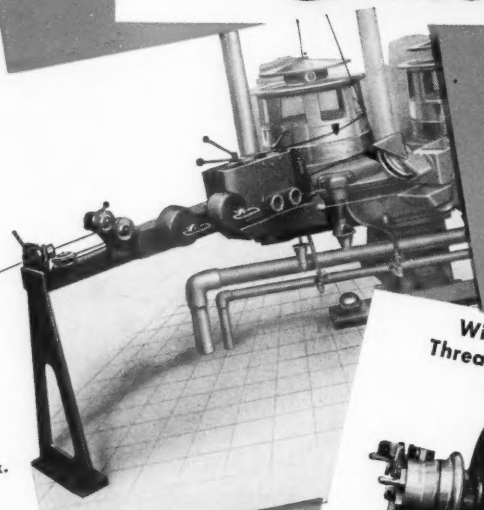
HERBORN

Auxiliary Machines for the Wire Industry

Wire Pointing Machine, Model AS III

for Alu wire between .472" and .059"
Copper wire— .492" and .059"
Low carbon steel wire— .393" and .059"
High carbon steel wire— .315" and .059"

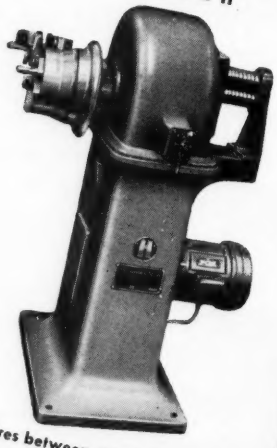
Wire Scrap Baling Machine, Model BM 1



Mechanical Scale Removing Equipment, Model MEA

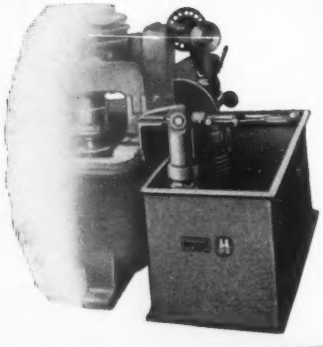
for Low Carbon Steel Wires of .255" max.

Wire Pointing and Threading-up Machine Model E II



for wires between .118" and .027"

Coppering and Bright Drawing Arrangement Model CU II

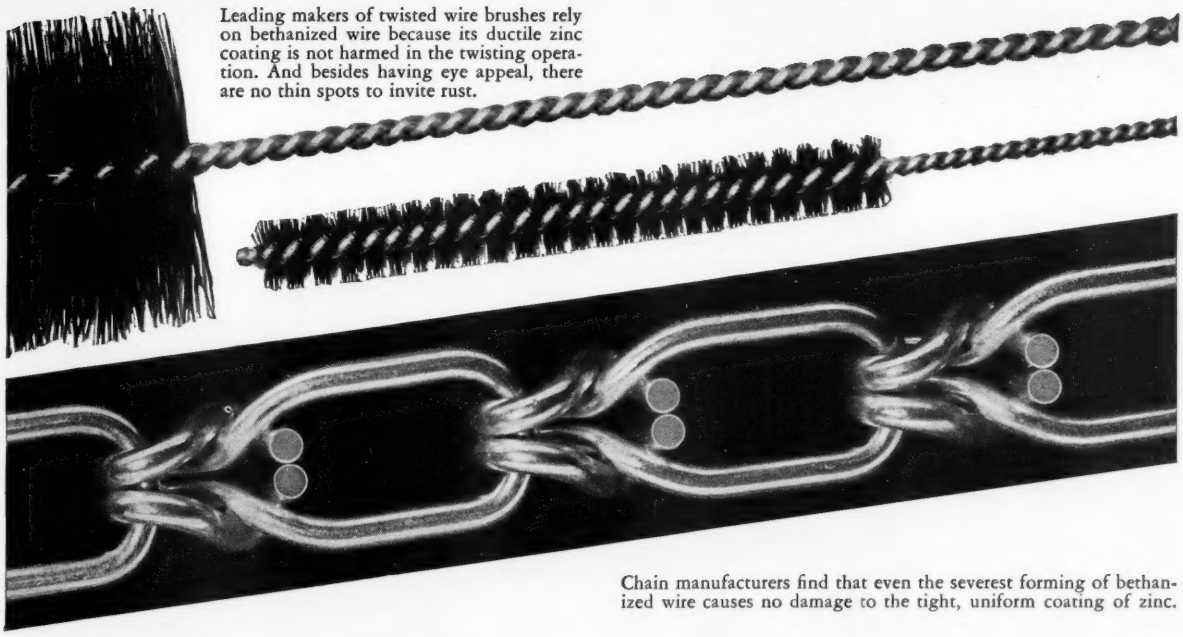


MASCHINENFABRIK HERBORN

BERKENHOFF & DREBES A.-G. • HERBORN (DILLKREIS) GERMANY

Sole Agent in U.S.A.: Kurt Orban Company Inc., 205 East 42nd Street, New York, N. Y. Phone: Murray Hill 4-7700, Cables: ORBANOC, N. Y.

Sole Agent in Great Britain: P. A. Mead Ltd., 3 Vincent Parade, Finsbury Park, London, N. 4, Telephone: ARChway 2127.



Leading makers of twisted wire brushes rely on bethanized wire because its ductile zinc coating is not harmed in the twisting operation. And besides having eye appeal, there are no thin spots to invite rust.

Chain manufacturers find that even the severest forming of bethanized wire causes no damage to the tight, uniform coating of zinc.

Pure zinc . . . perfectly bonded to steel . . . that's bethanized wire

What sets bethanized wire apart, above any other feature, is the perfect bond between the pure zinc coating and the steel base. As the wire goes through the bethanizing process, pure zinc is electrolytically deposited on the steel, atom by atom, building up a tight, uniform protective armor.

That is why bethanized wire is hard to beat for corrosion-resistance. The zinc coating is so even that there are no thin spots where corrosion can find a foothold, and so ductile that it goes through severe forming and fabrication without damage.

The sparkle of pure zinc adds eye-appeal to wire products. Now is a good time to see what bethanized wire can do for you. Either light or heavy coating weights can be supplied in hard- or soft-temper wire. Our nearest sales office will give you complete information.

Here's an easy way to judge bethanized wire for yourself . . . let us mail you a small sample piece. You can twist it, bend it, wrap it around its own diameter—even draw it through dies—and the ductile zinc won't crack or peel off.

Write now for your sample. Address your request to Bethlehem Steel Co., Room 1037, Bethlehem, Pa. If you want enough bethanized wire for a production test, our Sales Department will gladly make arrangements to send you a trial order of the proper gage, temper, and coating weight.

BETHLEHEM STEEL COMPANY, BETHLEHEM, PA.

On the Pacific Coast Bethlehem products are sold by Bethlehem Pacific Coast Steel Corporation. *Export Distributor:* Bethlehem Steel Export Corporation

BETHLEHEM STEEL

For the FINEST Dies...

Specify

DIES... TOOLS... WEAR PARTS... BLANKS...

TELEPHONES: FACTORY and BRANCHES

BALTIMORE, MD. HOpkins 7-5078
BIRMINGHAM, ALA. 54-1262
BOSTON, MASS. DEcatur 2-4456
BUFFALO, N. Y. BAiley 4555
CHICAGO, ILL. NAtional 2-3434
CINCINNATI, OHIO KIrby 2818
CLEVELAND, OHIO WOodbine 1-1742
CLIFTON, N. J. PRescott 7-8610
DALLAS, TEXAS DIxon 4038
DENVER, COLO. AComa 0889
DETROIT, MICH. UNiversity 4-6400
EAST LANSING, MICH. EDgewood 2-5331
FRANKLIN PARK, ILL. GLadstone 5-3014
HARTFORD, CONN. ADams 2-5197
HOUSTON, TEXAS OSage 3-5877
HUDSON, N. Y. 8-7710
INDIANAPOLIS, IND. BRoadway 9372
KANSAS CITY, MO. Baltimore 1700
LIGONIER, IND. 414
LOS ANGELES, CAL. LOgan 5-9811
LOUISVILLE, KY. Taylor 5960
MILWAUKEE, WISC. FRanklin 4-1364
MINNEAPOLIS, MINN. HYland 9511
MOLINE, ILL. Moline 2-3821
NEW YORK, N. Y. MUrray Hill 3-0291
ORISKANY, N. Y. Utica 6-1988
PHILADELPHIA, PA. TEnnessee 9-5478
PITTSBURGH, PA. HIland 1-8548
PORTSMOUTH, OHIO Scioto 913Y
ROCHESTER, N. Y. LOcust 4882
ROCKFORD, ILL. Enterprise 2504
SAGINAW, MICH. 4-3384
ST. JOSEPH, MO. 2-0805
ST. LOUIS, MO. MIssion 7-0113
SAN FRANCISCO, CAL. YUkon 6-6505
SCRANTON, PA. Diamond 3-1496
SEATTLE, WASH. SEneca 5488
SPRINGFIELD, MASS. Springfield 6-2673
SYRACUSE, N. Y. 75-5159
WAUKEGAN, ILL. ONtario 2-5220
WEST NEWTON, MASS. LAsell 7-3103
WICHITA, KANSAS TEmple 8-3476
YORK, PA. 2-8921

IN CANADA: (TOOLS) CARBIDE TOOL COMPANY,LTD. W. Toronto 3, Ont. (DIES) VASCARB TOOL & DIE CO. Hamilton, Ont.

The Wire Outlook

As we are about to go into the Fall season, the earlier prognostications about the beginning of a return to more active business seems to be justified. The extraordinary behavior of the stock market in the last couple of months may also be taken as a vote of confidence on the part of investors, for it is usually considered that security prices discount the future.

One reason for this is that for the first time since 1940 investors and savers have a sound dollar. Capital for risk-taking ventures is gradually emerging from hiding. Money is abundant and low in cost and the prospects of increasing volume of business are considered excellent. Unemployment, in spite of the flat level of business through the summer, has dropped because so many concerns have been girding themselves for an upswing.

Steel, that has been plentiful for many months, may not be quite so available on short notice later in the year. The building boom has continued unabated and has been one of the principal supports of industrial activity. Aluminum is the only major metal that is being produced at capacity levels—one and a half million tons per year, which has topped 1953's output. Producers feel confident that demand will continue to expand.

Manufacturer's inventories have been pared to a minimum, and any sudden demand could create shortages. It is expected, however, that the increase in buying, when it comes, will be gradual enough to permit an orderly adjustment in production schedules. Personal income, it is anticipated, will be slightly ahead of 1953, when consumer buying was at an all-time high. This should provide a sound basis for satisfactory markets in the future.

While government spending undoubtedly accounts for some of our prosperity, it will not be the policy of the Administration to do any pump-priming to create a false sense of good business. Industry, for the first time in more than two decades, is "on its own."

While there has been a slight increase in orders for manufacturers wire, no real pickup is anticipated before this month. Merchant wire sales have been better this year than last and the demand for wire from farm equipment manufacturers has been unexpectedly good. Considering summer shut-downs, this is a good sign.

Consumer wire inventories are at rock botton, some too low, and volume placed with mills has improved slightly. Basic wire sales have shown a mild betterment, particularly for wire required for industrial assembly. Guard rail, cable and wire mesh for highways and construction has held up in volume, but rope sales have been slow. Nails have been moving well. Interest in wire fencing has been active.

Furniture spring users are now placing orders for fourth quarter deliveries, but wire for the automotive industry, for appliances and for many other consumer goods are not expected to show much improvement until October.

Electric wire and cable manufacturers have probably passed the low point of their back-logs for the first half and a number of concerns are reported to be enjoying substantial increases in shipments in bare and weatherproof wire. While there has been some up-swing in paper and lead cables, there is still plenty of open capacity for more business. The stabilizing of the price of copper at a 30 cent ingot base has helped buyers to go ahead, since the price of copper is a major element in the cost of much electrical equipment.

The key question to the next few months will be consumer buying. People have been spending more freely than most merchants expected and if the trend continues and goods are made available, there will be every reason for our economists to write 1954's history on an optimistic note.

—from the Editor's Desk

Steelskin

Manufacturers of

POWDERS, COMPOUNDS GREASES & COATINGS

for

WET & DRY DRAWING

of

WIRE, TUBING BARS & SHEETS

NON-FERROUS FERROUS

STEELSKIN CXH
Wire-Drawing Powder

More wire is drawn through **STEELSKIN CXH** than any other lubricant.

STEELSKIN CXH is a compounded metallic-stearate-type soap powder used for drawing both high and low-carbon steel wire, as well as many non-ferrous metals. It is being used successfully with all types of coating.

Wire for springs, rope, nails, tire bead, screen cloth, poultry netting, galvanizing and many other applications is drawn through **STEELSKIN CXH.**

And REMEMBER . . . as a STEELSKIN customer, you are entitled to STEELSKIN "on-the-job" service. This service is backed by over 40 years' experience in the field of wire-drawing lubrication.

R. H. MILLER
Company, Inc., Homer 1, N. Y.

STEELSKIN

First in
LUBRICATION!

First in
SERVICE!

Since 1909

FILL IN COUPON AND MAIL TODAY!

Please send more information on
STEELSKIN PRODUCTS

We draw: ☐ Steel ☐ Dry ☐ Sizes .....
☐ Copper ☐ Wet .....
☐ Other — Specify .....

Please have representative call.

Name ..... Title.....

Company .....

Address .....

WIRE
AND WIRE PRODUCTS

A monthly publication devoted to the production of Wire, Rod and Strip.
DRAWING — ROLLING — EXTRUDING — FORMING — FABRICATING

Vol. 29 SEPTEMBER, 1954 No. 9

Wire Flattening — An Appraisal of Today's Theory and Practice

by A. I. Nussbaum
Rolling Mill Division
Stanat Manufacturing Co.
Long Island City, New York

Part II—Wire Flattening Practice

In this second part of Mr. Nussbaum's article is described the design and operation of mill equipment used in modern wire flattening practice. Part 1—Wire Flattening Theory, was published in the August, 1954, issue of Wire and Wire Products.

Wire flattening today is an important metal-working process employed in both the ferrous and nonferrous industries for the production of strip generally in a thickness range from 0.001 in. to No. 10 B. & S. gauge (0.102 in.) and in a width range from a few thousandth to ⅜ in. Sections beyond this range are normally produced more economically by the slitting of wide strip.

★ ★ ★

The modern wire flattening mill has come a long way from the slow, cumbersome and inaccurate single-stand machines which were in use at the beginning of the present century. The majority of mills built today are two or three-stand tandem two-high units having roll diameters of 4 in. to 10 in. and speeds between 500 and 2000 f.p.m. Depending on the rolling torques and speeds involved, they utilize either a herringbone pinion stand and universal spindle drive (Fig. 4) or a direct drive using helical idler gears to couple the two rolls (Fig. 5). Probably the outstanding points in the construction of the up-to-date wire flattening mill are the use of:

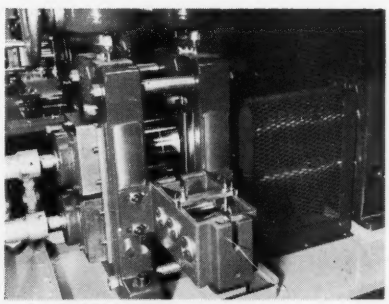


Fig. 4—Wire Flattening Mill equipped with Universal Spindle Drive.

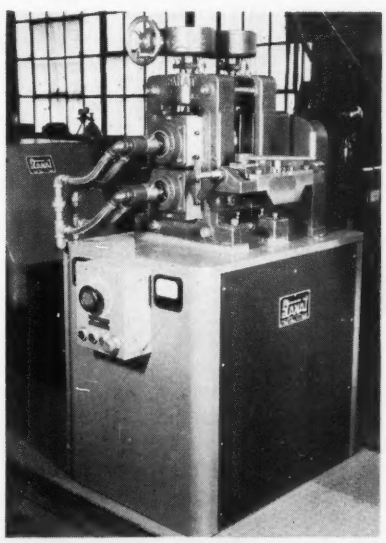


Fig. 5—Wire Flattening Mill equipped with Direct Idler Gear Drive.

(a) multiple mill stands mounted in tandem;
(b) anti-friction roll neck bearings;
(c) micrometer adjustment worm-gear screwdowns;
(d) internally water-cooled rolls;
(e) rolls faced with cemented tungsten carbide rings;
(f) vertical edgers between mill stands;
(g) adjustable lay traversing take-up reels;
(h) extremely high and steplessly variable rolling speeds;
(i) electronic controls synchronizing the mill stands; and
(j) automatic thickness and width gauging equipment.

Tandem Mills

The early, slow method of feeding wire in successive passes through one and the same mill stand is today considered uneconomical, except for certain small-run specialty work. It was soon realized that greatly improved productivity could be obtained by mounting and operating two or more mill stands in tandem, but the major difficulty to be overcome in this respect was the synchronization of the mill. Initially, a popular synchronizing method was to use constant speed a.c. motors in conjunction with such mechanical means of speed variation as the "Reeves" and the "P.I.V." drives.

★ ★ ★

With the growing acceptance of the Ward-Leonard variable speed drive in strip rolling mills, this type of drive also became more common in the field of wire flattening mills and today is without a doubt the most commonly adopted means of powering these machines. Whether two or five mill stands are involved, this d.c. drive furnishes perfect mill synchronization, stepless speed adjustment, controlled acceleration and deceleration and maintains tensions constant at whatever value selected.

★ ★ ★

Fig. 6 illustrates a representative method of arranging a modern two-stand tandem mill. A welded steel plate base encloses all piping and wiring and carries all the individual mill elements, thus assuring perfect alignment. The round wire is uncoiled from a pay-off reel which may be equipped with an adjustable friction brake or electrical means of generating a drag effect. It is common practice to mount a roller straightener and an oiler at the entry side of the first mill stand, with the wire picking up the rolling lubricant as it passes through the oiler.

★ ★ ★

As commercially available round wire generally lacks the close diameter tolerances needed for the production of precision-sized flat wire, it is frequently necessary to mount a drawing die within the oiler attachment ahead of the No. 1 mill stand. In this manner, the round wire is given a slight sizing pass prior to entering the initial flattening pass. If it is desired to subject the round wire to a somewhat heavier draw, a capstan unit may have to be mounted between the die and the first mill stand in order to obtain sufficient drawing pull. Such an arrangement, in turn, requires a set of synchronizing dancer rolls to be mounted between the capstan and the No. 1 mill stand.

★ ★ ★

After having been flattened in passing between the rolls of the first stand, the wire threads around the two fixed and one floating pulleys of the dancer roll stand and then reaches the No. 2 mill stand. In accordance with usual practice, the wire passes between the vertical rolls of an edging stand before entering the horizontal rolls of the second mill stand. On leaving the final stand, a continuous visual indication of wire thickness and width is commonly obtained by letting the stock pass between the gauging rollers of a set of "flying micrometers". Finally, the flat wire is spooled on a traversing take-up reel under conditions of adjustable tension and adjustable lay.

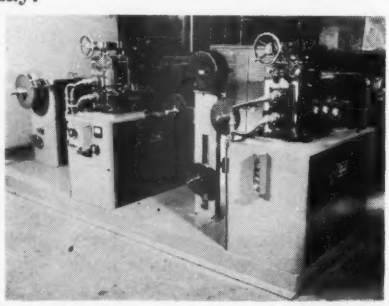


Fig. 6—High-Speed Two-Stand Tandem Wire Flattening Mill.

Roll Neck Bearings

The extreme accuracy and the high rolling speeds expected of the modern wire flattening mill have ruled out the use of bronze bearings on the roll necks. Fig. 7 shows a mill design based on the very successful combination of heavy-duty cage-type needle roller bearings to take vertical loads with ball bearings to take horizontal thrust loads. On a 6 in. diameter mill, for example, the 3½ in. bore by 3½ in. wide roll neck bearings used have a load capacity of 45,000 lb. each, based on a roll speed of 500 r.p.m. Such a capacity is more than ample to cope with the relatively light separating forces which occur in wire flattening.

★ ★ ★

All bearing chocks are sealed and protected against the entrance of foreign particles and moisture by spring-loaded synthetic rubber seals. The chocks are free to slide vertically in the windows of the mill housings and are restrained horizontally by means of gibs mounted on the housing faces. While the chocks of smaller mills are fitted with individual grease nipples, centralized forced feed bearing lubrication systems are generally used on larger machines.

Screwdown Mechanism

In the interest of precision thickness tolerances being maintained, it is most important to furnish the stands of a wire flattening mill with an extremely accurate and easily adjustable screwdown mechanism. The original method of direct, individual screwdown adjustment by dual handwheels has now largely been replaced by the worm drive screwdown shown in Fig. 8. This mechanism permits the finest possible adjustment of the roll setting, even when the mill is actually in operation. Using a hardened alloy steel screw of 8 threads per inch and a wormgear ratio of 20:1, a single revolution of the handwheel corresponds to only about 0.006 in. of vertical screwdown movement. Thus, it has been possible to graduate the handwheel micrometer dial in ten-thousandths of an inch, facilitating

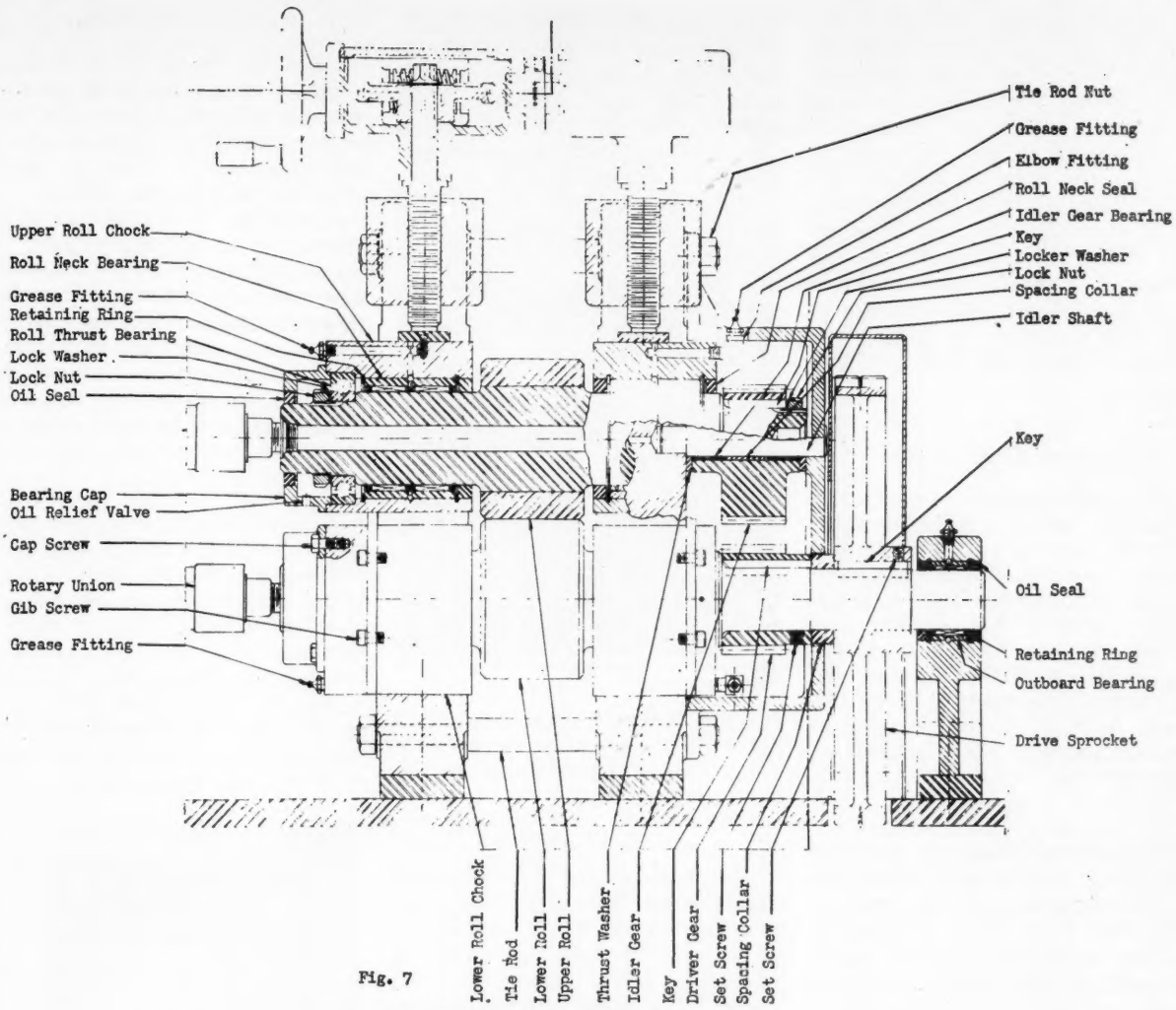


Fig. 7

Fig. 7—Design of Wire Flattening Mill Stand.

truly accurate pass control. The horizontal shaft connecting the two screwdown units is fitted with a simple clutch device which allows the mill to be corrected readily for roll parallelism. In the case of larger mills, it is now common practice to provide motorized screwdown control as an alternative to manual control.

Alloy Steel Rolls

The successful operation of today's high-speed wire flattening mills greatly depends on the quality of the forged and hardened rolls or roll shells used. Recent research work by various makers of high alloy tool steels has led to roll materials having a close-grained homogeneous structure and an extremely high surface hardness and abrasion resistance.

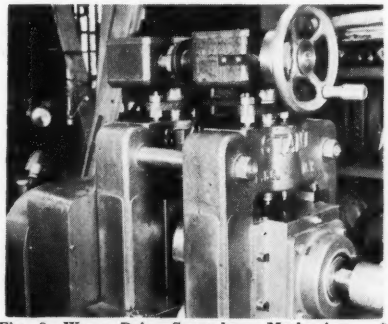


Fig. 8—Worm Drive Screwdown Mechanism.

While the conventional high-carbon high-chromium steels can be heat-treated to obtain a surface hardness of Rockwell C-64, it is now possible to achieve surface hardnesses of Rockwell C-66 to 68, using a special wrought high speed steel having a nominal composition of: 1.57% carbon; 0.25% silicon; 0.25% manganese; 12.50% tungsten; 4.75% chromium; 5.00% vanadium; and 5.00% cobalt.

★ ★ ★

A relatively high hardness in the neighborhood of Rockwell C-62 is also maintained on the roll necks as, in the interest of space economy, roller bushings without inner races are used in the chocks. This method of running the roll necks directly in contact with the bearing rollers also results in greater concentricity of the rolls. This concentricity can be further improved by regrinding and polishing the rolls while running on their own necks instead of on the roll centers.

★ ★ ★

An internal water circulating system applied to the rolls furnishes the wire flattening mill operator with an extremely fine means of gauge control. As shown

in Fig. 5, the rolls are fitted with rotary unions and flexible hoses. These unions are equipped with self-aligning floating rotary seals and with pressure equalizing chambers to reduce the pressure against the seals to a minimum. The unions, in turn are connected to a circulating system arranged for either a heating or a cooling effect. It is thus possible to obtain very slight dimensional changes in the roll diameter by appropriate water temperature and flow controls.

Tungsten Carbide Rolls

The introduction of cemented tungsten carbide rolls has made possible greater reductions at greater speeds, closer size tolerances, improved surface finish and longer service life between regrinds. With a modulus of elasticity as high as 95,000,000 p.s.i. and a compressive strength of 750,000 p.s.i., tungsten carbide constitutes an exceedingly rigid and dense roll material.

★ ★ ★

The general shape of the wire flattening mill rolls is unsuitable for solid tungsten carbide construction, and it is more common to employ a one-piece carbide sleeve press-fitted and keyed to an alloy steel roll arbor heat-treated to Rockwell C-55 to 60. The minimum wall thickness of such sleeves is generally ¾ in. for 6 in. diameter rolls and 1 in. for 8 in. diameter rolls, and it is usual to position threaded steel collars on both sides of the sleeve.

★ ★ ★

Carbide rolls are considerably more expensive in first cost than alloy steel rolls. They require great care in grinding and polishing, 500 or 600 grit diamond wheels and diamond lapping compounds being used in finishing work. However, it is generally agreed that the advantages to be gained from their use in many fields of wire flattening more than justify their application.

Vertical Edgers

Incorporating one or more vertical edging stands in a wire flattening line greatly facilitates maintaining close width tolerances in the finished strip. Furthermore, it helps to correct the convex strip edge which results from flattening round wire through horizontal stands only. Fig. 9 shows a simple single-pass vertical edging unit mounted at the entry side of a horizontal mill stand. With ample

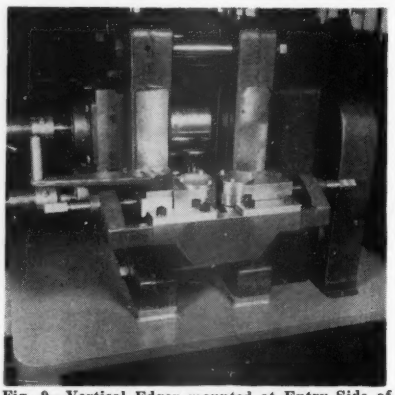


Fig. 9—Vertical Edger mounted at Entry Side of Mill Stand.

traction being provided by the mill stand, it is convenient to use idler rolls in the vertical edger on the smaller mills.

★ ★ ★

The edging rolls are hardened and ground high alloy tool steel and are furnished with a number of grooves to suit the types of edges and stock sizes to be produced. The rolls run on tapered roller bearings and are easily exchangeable. Each roll is equipped with an individual screwdown mechanism to set the desired degree of edge reduction and to obtain perfect alignment of the rolls relative to the path of the wire. To allow for easy threading of the wire at the start of a new coil, the edging units are equipped with a quick-acting cam release actuated by a convenient hand lever.

Take-Up Reels

Much of the quality and appearance of the finished spool of flat wire leaving the mill depends on the action of the take-up reel. The importance of maintaining the wire in a straight line, free of any kinks, has led to the universal use of the traversing take-up reel. Spools are mounted on the take-up shaft which, in turn, is traversed in accordance with the lay desired while it recoils the wire.

★ ★ ★

The take-up reel may have its own variable speed power drive or may be driven from the preceding mill stand by a chain or shaft transmission. In the latter case, the winding tension is varied by means of an adjustable friction clutch which, by virtue of its slipping action, effects synchronization between the reel and the preceding mill stand. In this manner, the winding tension is kept reasonably constant over the comparatively small coil build-up ratios encountered in wire flattening.

★ ★ ★

To produce a uniform lay across the entire width of the spool, the traversing take-up shaft must travel, as nearly as possible, at constant velocity. This motion is generally obtained with the aid of heart-shaped cams or with left-hand/right-hand thread traversing screws. The drive mechanism of a take-up reel employing the latter method is shown in Fig. 10.

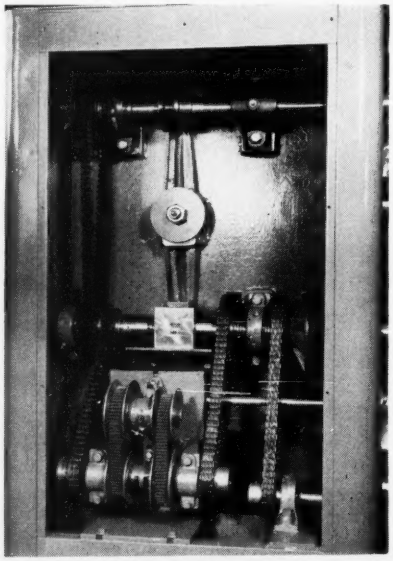


Fig. 10—Drive Mechanism of Traversing Take-Up Reel.

Tandem Mill Drives

There can be no doubt that the adjustable-speed d.c. drive based on the variable voltage principle was needed to develop a truly flexible, sensitive and productive tandem flattening mill. Arranged for operation from a plant's available a.c. supply, these "packaged" drive

units are today available in a wide range of sizes, providing stepless speed changes, smooth acceleration and deceleration, rapid and cushioned braking and maintaining proper rolling and winding tensions.

★ ★ ★

The power unit of a representative 30 h.p. drive is shown in Fig. 11. It comprises a 30 h.p. motor-generator set operated from a 220/440 volt, 3 phase, 60 cycle a.c. supply as well as the drive control panel. In this particular case, the power unit feeds two 15 h.p. adjustable-speed d.c. motors which, respectively, drive the No. 1 and No. 2 mill stands. This type of drive makes possible continuous duty speed ranges up to 16:1. An 8:1 speed range below that of the basic full load speed of the drive motor is obtained by armature voltage variation. An additional speed range above the basic full load of the drive motor is obtained by a combination of voltage variation and weakening of the motor field. Voltage regulation is obtained by varying, through operation of the speed-setting rheostat, the generator field current which is either supplied by an electronic exciter or by a rotating exciter belt-connected to the generator.

★ ★ ★

As indicated in Fig. 6, both mill stands are provided with manually operated vernier rheostats. When flattening the heavier sizes of wire, it is not necessary to rely on dancer rolls for mill synchronization. Instead, the vernier rheostats on the two mill stands are set manually in accordance with the desired speeds and so as to balance the loads properly between No. 1 and No. 2 stands. It is standard practice to provide compound windings on the motors, which will allow them to share the load adequately and prevent wire breakage. The actual load imposed on a given motor will depend upon the individual setting of its field rheostat determining the tension between stands and upon the amount of reduction being accomplished by the mill stand. Under normal steady operation, settings made by the manual rheostats will remain constant and any slight variations

Fig. 11—Power Unit of 30 H.P. Adjustable-Speed Mill Drive.

which occur will be made up or corrected for by the wire itself.

★ ★ ★

In order to obtain a universal mill drive, a dancer roll is provided to be used when flattening fine wire. A selector switch is mounted on the control panel allowing the operator to select to operate with or without the dancer roll. When operating without the dancer roll, manual field rheostats provide the necessary control. Such an arrangement will operate satisfactorily with two, three, four or five stands and it is merely necessary to allow enough field control range in the motors to cover the anticipated elongation between stands.

★ ★ ★

When dealing with fine wire, synchronization between No. 1 and No. 2 mill stands is obtained by the dancer roll stand shown in Fig. 6. In cases of wire speeds up to about 600 f.p.m., the dancer roll usually operates a conventional dancer roll rheostat. However, when considerably higher speeds are anticipated, the travel of the dancer roll becomes great enough to present a serious mechanical problem. Therefore, with high-speed applications, an electronic dancer roll control is more desirable since its rate of response or its rate of correction is faster and therefore can be accomplished with a shorter mechanical displacement of the dancer roll itself. By virtue of its faster reaction time, the electronic dancer roll control does not require as great an amount of loop storage as a standard rheostat control. The electronic control unit comprises a two-coil, air core, iron plunger reactor which is connected into a special phase-shift bridge circuit and which produces its full output with only a 9/16 in. movement of the core. To obtain stable mill operation, this unit is also provided with anti-hunt control.

★ ★ ★

A typical two-stand wire flattening mill drive control generally incorporates the functions of "Run", "Jog" (at a fraction of the motor base speed), "Stop" (with motors coasting to rest), "Emergency Stop" (with motors brought to rest by dynamic braking), "Controlled Acceleration and Deceleration" and "Manual-Automatic" selection determining whether the manual vernier rheostat or the automatic dancer roll unit is in control of the No. 2 stand drive motor field.

Automatic Gauging

While the use of hand micrometers is satisfactory on slow-speed mills, automatic continuous means of gauging have to be adopted to control the modern high-speed wire flattening mills. It is now common practice on these mills to mount a continuous thickness gauge and a continuous width gauge in tandem between the last mill stand and the take-up reel.

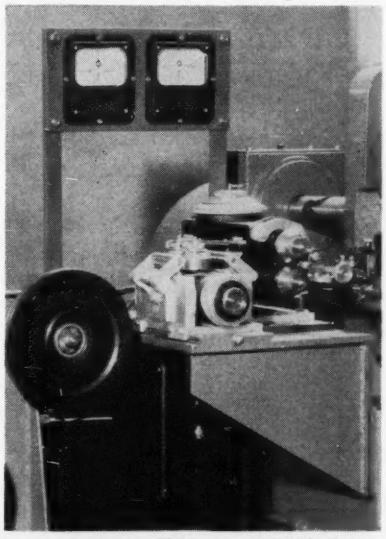


Fig. 12—Continuous Thickness and Width Gauges.

The popular Pratt and Whitney "Magnetic" gauges, which are il-

(*Please turn to page* 1033)

WHAT DO YOU NEED?
BIG ONES
OR LITTLE ONES
STANDARD SIZES
Flange | Traverse | Barrel | Arbor
2½" | 3" 3¼" | 1¾" | .628"-.633"
3" | 3" 3¼" 3½" | 1¾" or 2" | .625"-.633"
4¼" | 3" 3¼" 3½" | 3¼" | .635"
4½" | 3" 3¼" 3½" | 2½" | .635"
4½" | 6" | 2½" | .635"
5" | 2¾" 3" | 3.880" | .531"
6" | 3" 3¼" 3½" | 3½" | .635"
6" | 3" 3¼" 3½" | 3½" | 3"
6" | 6" | 3" or 3½" | .635"
6" | 6" | 3½" | 3"
6½" | 3" 3¼" 3½" | 3½" | .635"
6½" | 3" 3¼" 3½" | 3½" | 3"
6½" | 6" | 3½" | .635"
6½" | 6" | 3½" | 3"
7" | 3" 3¼" 3½" | 3½" | .750"
7" | 6" | 3½" | .750"
8" | 3½" 6" 6¼" | 4" | 3" or 3 33/64"
8¼" | 3½" to 7½" | 4" | 3.630"
10" | 6" | 5" | Optional
12" | 6" | 6" | Optional
Light weight, drawn Aluminum Alloy
Here they are! A complete line of
ACROPAK SPOOLS... any size for any need
Our job is to help wire manufacturers reduce spooling costs and we've built up a record with these strong, lightweight, drawn Aluminum alloy spools. A complete line—any size you specify—with special emphasis now on big sizes to meet the trend towards larger packaging for economy. ACROPAK spools have reduced operating and shipping costs for others—why not for you, too?
Do you need special sizes? We have the engineering experience and tool room facilities to design and make any special spool you may need.
ACROMETAL PRODUCTS INC.
Division U. S. Bobbin and Shuttle Co., 616 Fifth Street N., Minneapolis 1, Minn.

Heat Aging Characteristics of Insulating Varnishes

by H. I. Morgan[1] and K. N. Mathes[1]
General Electric Company
Schenectady, New York

Presented at the 57th Annual Meeting of the American Society for Testing Materials, Chicago, Illinois, June 14, 1954. Reprinted with permission from 'Symposium on Temperature Stability of Electrical Insulating Materials,' S.T.P. 161, ASTM, 1916 Race Street, Philadelphia 3, Pa.

Introduction

Insulating varnish serves two important functions in the insulation system of electrical equipment:

a. **Bonding together of wires and insulating components.**
b. **Protection against the entrance of moisture, dirt or other contaminants.**

★ ★ ★

As the insulation system is exposed to operating or high ambient temperature, physical changes occur in the insulation for which changes in the insulating varnish are in part responsible. When the varnish no longer bonds together the insulation structure, or loses flexibility so that cracks and discontinuities develop, the system is subject to failure, mechanically or electrically.

★ ★ ★

Many methods have been used to study the thermal degradation of insulating varnish. Some of these methods are indirect, such as, loss in weight or changes in infra-red spectra. Such methods give important insight into the mechanism of the aging process, but seldom can be translated into functional significance. It is proposed, herein, to describe two methods for determining flexibility of aged insulating varnish:

a. **The mandrel flexibility test.**
b. **A film rupture test making use of a deflected beam.**

Mandrel Flexibility

For many years, insulating varnishes have been evaluated by coating .005 inch copper panels with two coats of varnish to a thickness of approximately .002 inch, aging these panels in an oven at 105° C. and more recently at 135° C., and after aging, bending over a mandrel one-eighth inch in diameter. Apparently this test evolved from earlier tests on finishes applied to steel panels. The details of the mandrel test have varied somewhat over the years and in the various specifications. The two specifications now used most are listed:

ASTM Heat Flexibility Test[2]
MIL-V-1137a-dated November 15, 1952[3]

In order to study the mandrel test, various sized mandrels have been used and aging has been conducted at several different temperatures. By increasing the mandrel diameter, it is possible to change the elongation of the varnish film as it is bent (see Table I). The elongation of the varnish film as a function of mandrel diameter is plotted in Figure 1 for a nominal film thickness and for the specification range. (Curiously, no allowable range for copper thickness is specified, but the range normally encountered has been used.) It is immediately apparent from this plot that for small mandrel diameters, differences in thickness (in copper base and varnish film) result in considerable change in elongation. Trouble in obtaining uniform results with ⅛"

TABLE I

MANDREL FLEXIBILITY VARNISHES

Assume neutral axis at center of copper.
(Considerable shear stress occurs at interface between copper and varnish)

d = mandrel diameter
t_1 = copper thickness
t_2 = varnish build (one side)

$$1/2\ C_1 = 1/2\ \pi\ (d + t_1)$$

$$1/2\ C_2 = 1/2\ \pi\ (d + 2t_1 + 2t_2)$$

$$\% \text{ Elongation at outer varnish surface} = \frac{C_2 - C_1}{C_1} = \frac{t_1 + 2t_2}{d + t_1}$$

	% Elongation				
Mandrel Dia.-Inches	.125	.250	.500	1.00	2.00
.005 Cu. - .002 Varnish	6.92	3.53	1.79	0.892	.450
.0048 Cu.-.0018 Varnish	6.48	3.31	1.67	0.832	.422
.0052 Cu.-.0022 Varnish	7.38	3.76	1.89	0.955	.482
.005 Cu. - .001 Varnish	5.38	2.74	1.385	0.695	.351

For numbered references, see list at end of paper.

At L. A. Young Spring & Wire Corporation, Detroit, it takes a combination of quality steel wire; modern, high speed machines; and skilled men to produce high quality steel springs like these automobile hood hinge springs.

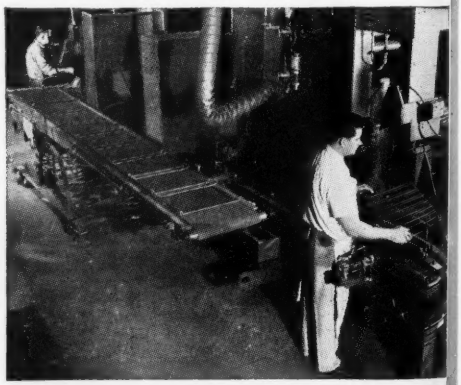
How Pittsburgh Steel Helps L. A. Young Produce High Quality Steel Springs At Machine-Gun Speed

Take 10 feet of .216 inch diameter oil tempered spring wire, form it into a spring 10.5 inches long by coiling it 35 times, extend that spring 14.5 inches and you have a machine capable of exerting a pull of 400 pounds. In other words springs, like the auto hood hinge springs shown in photo above, are machines.

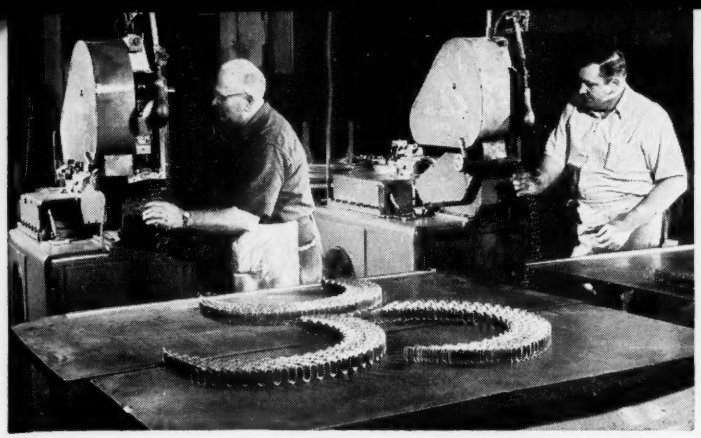
Anyone who produces these identical springs by the thousands in an eight-hour turn on one machine must realize the importance of having the finest quality steel wire, the most modern high speed machines, and

Brake Silencer Springs to dampen auto brake drum vibration are fabricated on this Sleeper-Hartley spring coiler. Each spring contains 34.5 feet of .092-inch diameter hard drawn MB spring wire in 380 coils. After fabrication, the spring is 34⅝ inches long.

Cushion Springs for automobile seats are made from Pittsburgh hard drawn MB spring wire. On this Van Orman coiler and knotter, one of a battery at L. A. Young, 6-coil springs 5½ inches in length, are produced by the thousands.



Your Roast Beef, home-made pies and cakes are supported in your kitchen range on wire racks like these fabricated from Pittsburgh bright basic wire, nickel-plated for resistance to heat and rust. Here, rack frames are fabricated on an automatic resistance welding line.



For Your Auto Riding Comfort zig-zag springs like these are made from Pittsburgh hard drawn MB spring wire on high speed machines. A 41-inch spring contains 51 loops. Produced to an arc with a 13½-inch radius, the arc provides the spring in your seat cushions.

A Spring, the master cylinder of your brake system, releases the pressure when you release your brake. To stand up under this repeated usage, these master springs are made of high quality .067-inch diameter tinned music wire. Into one spring goes 22 inches of wire.

good production men all along the line.

● **Where It Comes From**—Pittsburgh Steel Company, one of the country's leading producers of wire for industry, is an important supplier of wire to L. A. Young Spring & Wire Corporation, because Pittsburgh wire can be depended on to meet or better Young's specifications for grade, size, temper, hardness, and above all, absolute uniformity coil end to coil end and coil to coil. The slightest variation from absolute uniformity in the wire feeding into an automatic coiler at machine-gun speed can cause a misfire that jams the works, reduces productivity, increases costs, reduces profits.

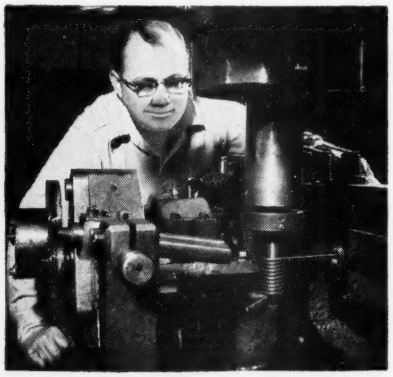
Pittsburgh Steel Company has been a wire producer for over 50 years. The long experience at steel making of their mill men and metallurgists, from the blast furnaces and open hearths through final wire drawing and finishing operations, goes into every pound of wire that is made.

On Pittsburgh Steel wire mills at Monessen, Pa., some of the most modern in the industry, are produced such grades as bright basic; low, medium and high carbon; all types of annealed wire; ACRS core wire; cold-heading wire; oil-tempered spring wire; hard drawn MB spring wire; and shaped wire.

● **Supplementary Line**—The wire mills of the subsidiary Johnson Steel & Wire Company at Worcester, Mass., producers of fine wire specialties, have just completed a thoroughgoing modernization. Their range includes armature binding wire; wire for brushes; metal stitching, hose reinforcement; stapling wire; bobby pin wire; tire bead wire; rope wire; oil-tempered and MB hard drawn spring wire; music spring wire right down to sizes as fine as a human hair.

The combined operations of these plants offer the wire user an unusually broad diversity of high quality wire to select from, assure him fast service to meet a wide variety of applications. Pittsburgh Steel's operations are geared to mesh smoothly with the customer's production-line requirements. Oil-tempered spring wire, for example, is stocked at Monessen for immediate shipment.

If, like L. A. Young, you use steel wire in your manufacturing operations, why not talk to a man from Pittsburgh Steel? You will find him at one of the company's district offices near you, or at the home office. A phone call or a letter will bring prompt action. He will be glad to show how you can get the full benefits of Pittsburgh Steel's ability to make the kind of wire you want and deliver it when, how, and where you want it.



Take Your Foot from the brake pedal and rugged, dependable, springs like these return the brake shoes to the "ready" position. To make this type of spring, 37 inches of .200 inch diameter Pittsburgh oil-tempered spring wire are formed into a 9¾ coil 3$\frac{5}{32}$ inches long.

"Everything New But The Name"

Pittsburgh Steel Company

Grant Building • Pittsburgh 30, Pa.

DISTRICT SALES OFFICES: Atlanta • Chicago • Cleveland Columbus • Dallas • Dayton • Detroit • Houston • Los Angeles New York • Philadelphia • Pittsburgh • San Francisco • Tulsa Warren, Ohio. **PLANTS:** Monessen, Pa. • Allenport, Pa. • Akron Los Angeles • Unionville, Conn. • Warren, Ohio • Worcester, Mass.

PRINCIPAL PRODUCTS: Hot and Cold Rolled Strip and Sheets • Strip Specialties • Seamless Tubular Products • Wire and Wire Products • Chain-Link Fence • Cargotainers • Steeltex

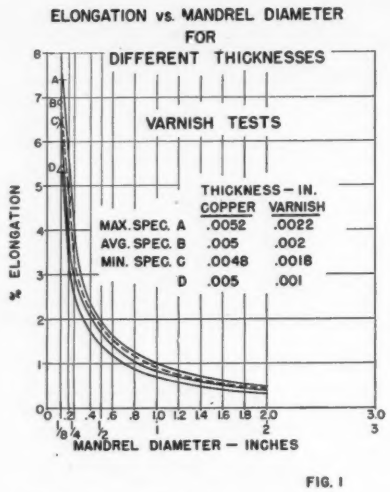


FIG. 1

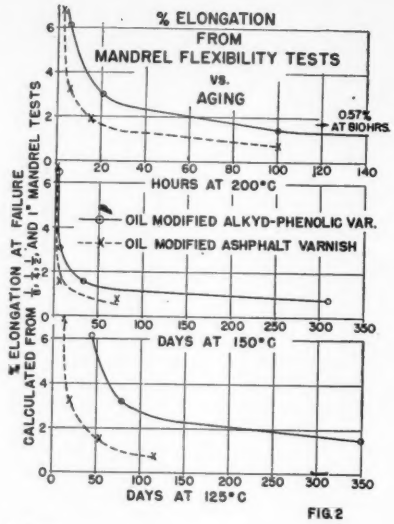


FIG. 2

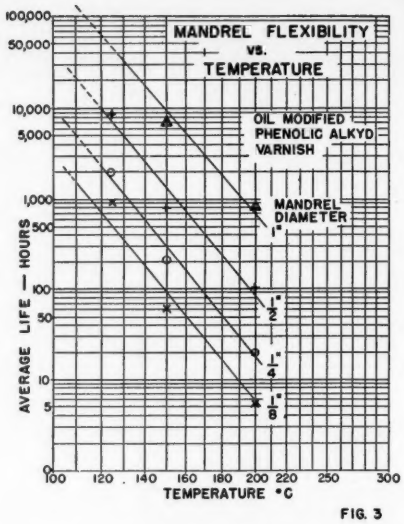


FIG. 3

diameter mandrel tests can no doubt be traced directly to this situation. On the other hand, the way in which the sample is bent around large mandrels is of considerable importance, as might be expected from the flat nature of the curve for mandrel diameters greater than one-half inch. Obviously, if mandrel tests are to be used, a one-half inch diameter mandrel producing an elongation of about 1.7% is optimum. Why these factors have never been considered is a mystery, but apparently the ⅛" diameter mandrel was adopted so as to get results "as fast as possible" without reference to the significance of the test. As a matter of fact, the elongation, which is significant in terms of service performance, is most important and will be considered later in detail. It is sufficient to say here that a value of about ½% seems significant. Such small elongations cannot be conveniently obtained with the mandrel flexibility test.

★ ★ ★

It is useful to plot test results obtained for different mandrel diameters in terms of the calculated % elongation at failure. In Figure 2, such results are plotted as a function of aging time at 125, 150 and 200° C. for oil modified alkyd phenolic varnish and for an oil modified asphalt varnish. These curves are particularly interesting in that they exhibit a rapid initial decrease followed by a very slow decrease in flexibility. A number of comparisons of aging time taken from these curves are given below.

Elongation Failure at	6%	3%	1½%	1%	
	Hours Aging at 200° C.				
Oil Modified Asphalt Varnish	2	6	24	70	
Oil Modified Alkyd Varnish	6	20	100	460	(est.)
Ratio of above	3	3.3	4.2	6.6	
	Days Aging at 150° C.				
Oil Modified Asphalt Varnish	1.25	2.5	7	30	
Oil Modified Alkyd Varnish	2.5	8.3	35	190	
Ratio of Above	2	4.2	5	6.3	
	Days Aging at 125° C.				
Oil Modified Asphalt Varnish	12	20	53	80	
Oil Modified Alkyd Varnish	45	85	350	==	
Ratio of Above	4.12	4.2	6.6	==	

From these figures, it is apparent that the ratio of the aging life for different varnishes determined at the 6% elongation of the ⅛" mandrel, which results in an elongation of 6%, may be very different from the ratio for these varnishes determined at a more significant value of elongation.

★ ★ ★

The per cent elongation for a proper, significant end point is open to question. Data for the alkyd-phenolic varnish is plotted in Figure 3 according to the method of Dakin (1)[4] as log of the aging time versus the reciprocal of the absolute temperature. The data in these curves can be compared in two ways, as follows:

Mandrel Diameter	Temperature °C. for 1000 hrs. life	Life at 105° C. Hours	Days	Years
1/8"	115	2000	83	0.23
1/4"	132	7000	292	0.80
1/2"	154	25000	1045	2.9
1"	192	170000	7380	20.3

The data for varnish life at 105° C. is perhaps the more significant. It should be recognized that the validity of extrapolation of this degree is open to some question and the results are approximate. Nevertheless, it is apparent on the basis of experience with electrical equipment operating at hot spot temperatures of about 105° C. that a life of many years can be expected. The life for a mandrel diameter of 1 inch (0.75% elongation) appears to be the most functionally significant.

★ ★ ★

If the mechanical strain in an insulation system is assumed to arise from the differential expansion between copper and insula-

tion, the following can be calculated:

% strain = $(A_1 - A_2)\ \triangle T - 100$
A_1 = Coefficient of thermal expansion for the insulation, and
A_2 = Coefficient of thermal expansion of copper.
Estimating the following:
$A_1 = 80 \times 10$ per deg. C
$A_2 = 16 \times 10$ per deg. C
$\triangle T = 100°$ C (from 0 to 100° C)
% strain = 0.64

★ ★ ★

Although this figure is quite approximate, it is apparent that the significant values of elongation are most likely to be considerably under 1%. Since the 1 inch mandrel (0.9% elongation) flexibility test is difficult to control as shown in Figure 1, a better method of evaluating varnishes at elongations under 1% is needed.

Deflected Beam-Film Rupture

If a beam is supported (not fixed) at both ends and deflected at the center, it is possible to produce very low strains in the outer surface of the sample by proper selection of beam thickness and span. Such a method can be adapted to the evaluation of insulating varnish as described in the appendix to the companion paper (2). This method is used to evaluate a combination of magnet wire insulation and varnish or varnish impregnated fabric. In a companion paper (2), this method has been extended to include varnish impregnated sheet insulation as well.

★ ★ ★

The advantages of the deflected beam method are graphically shown in Figure 4. The % elongation for three different types of samples used are plotted as a function of the deflection applied at the center of the sample. Very small elongations can be easily and accurately produced. The linear relationship is in sharp contrast with the critical characteristics for mandrel tests shown in Figure 1.

★ ★ ★

Although the varnishes could be evaluated as coatings on copper alone, insulating varnishes are practically never used in this fashion. In the experimental program undertaken, insulating varnish has been combined with other insula-

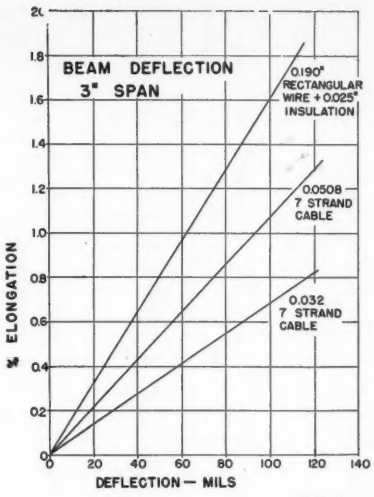


FIG. 4

tions in a manner representative of actual use. In Figure 5, the % elongation during aging at 150° C. is given for three different varnishes applied to the following three insulation systems:

1. 0.090 x .190 quadruple Formex* wire with ½ lap of .007" cotton tape.
2. 0.090 x .190 quadruple Formex wire with ½ lap of .005" glass tape.
3. 0.090 x .190 double glass insulated wire (phenolic varnish treated) with ½ lap of .005" glass tape.

★ ★ ★

Three very different types of varnish have been selected for comparison:

A. Long oil-modified alkyd varnish, a very slow curing varnish which may tend to volatilize slowly during aging.
B. Medium oil-modified phenolic varnish, a rapid curing thermosetting varnish commonly used for impregnation, particularly of random wound stators.
D. An unmodified phenolic resin used for impregnation of high speed rotors because of its strength and lack of creep at high temperatures. Varnish D is fast curing and is generally considered to be "brittle."

★ ★ ★

The differences in elongation between the three varnishes as a function of aging are shown clearly in Figure 5. Varnish A cures very slowly and retains considerable flexibility for very long periods of time. The "hump" in the curves is significant and is related to polymerization characteristics. Such "humps" are very pronounced with many silicone resins also. The unmodified phenolic, var-

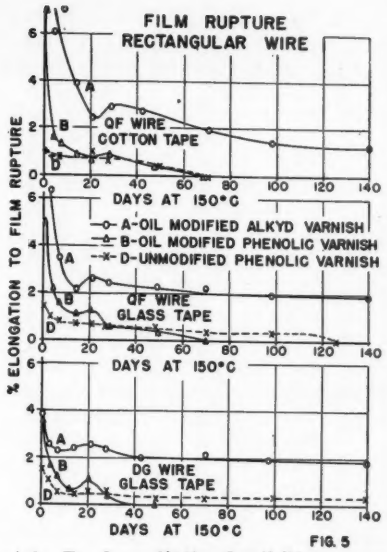


FIG. 5

nish D, has little flexibility even when first cured, but this flexibility is maintained in some cases much longer than for varnish A, which has considerable initial flexibility.

★ ★ ★

The effect of the underlying insulation on aging characteristics is somewhat less apparent. Cotton tape though initially more flexible (except with varnish D) does seem to result in more rapid aging. Formex wire possesses initial flexibility not shown by the double glass insulated wire. A number of interesting comparisons are given in the tabulations on the next page.

★ ★ ★

A review of the figure and tabulations leads to several interesting observations.

1. The order of comparison between varnishes is different at high and low elongations, for example, the unmodified phenolic resin has little initial flexibility but retains this value until ultimately it is comparatively more flexible than the aged oil-modified phenolic resin.

2. Associated insulations may interact differently with different varnishes. For example,

a. Cotton tape results in greater initial flexibility with the oil-modified alkyd varnish. On the other hand, glass tape gives greater initial flexibility than cotton with the unmodified phenolic varnish.
b. Glass tape as compared to cotton improves flexibility after long periods of heat aging for an unmodified phenolic and an oil-modified alkyd, but no difference is in-

Elongation Failure at	Days Aging at 150° C. 6%	2%	½%	¼%
QF wire - .007 cotton tape half lapped				
Varnish A	6	70	>140	>140
Varnish B	1	3.3	43	53
Varnish D	*	*	43	60
QF wire - .005 glass tape half lapped				
Varnish A	3	80	>140	>140
Varnish B	1	5	34	58
Varnish D	*	*	40	120
DG wire - .005 glass tape half lapped				
Varnish A	*	60	>140	>140
Varnish B	*	3	27	30
Varnish D	*	*	7	>140

* Failed before aging.

dicated for the oil-modified phenolic varnish.

c. Formex wire tends to be embrittled by the unmodified phenolic varnish.

d. Double glass insulated wire results in less flexibility than can be obtained with Formex wire.

e. The oil modified alkyd varnish seems to prevent serious embrittlement of Formex wire even after long aging periods at 150° C.

★ ★ ★

As described in the appendix to the companion paper (2), the deflected beam technique can be applied to round wires formed into a seven strand concentric cable representing, to a fair extent, a random wound coil structure. In Figure 6, flexibility versus aging at 160 and 200° C., is plotted for three combinations of magnet wire and varnish as follows:

E. Heat resistant enameled wire treated with a modified silicone varnish.

F. Heat resistant wire enamel treated with an oil-modified phenolic varnish.

G. Heavy Formex wire treated with an oil-modified phenolic varnish.

★ ★ ★

Results for heavy Formex wire treated with a modified silicone varnish have not been included because results were similar to sample G above and would have confused the figure.

★ ★ ★

Results plotted in Figure 6 show how much the characteristics of the magnet wire affect the performance of a combination of magnet wire and varnish. In reverse, the proper choice of varnish can reinforce the aging characteristics of the magnet wire. It is interesting that the shape of the curves at 160 and 200° C. differs to some extent. It may be suggested that at different temperatures, different types of chemical change may be favored. The minimum values for the modified silicone varnish are similar to the "humps" for the alkyd varnish in Figure 5.

Comparison of Mandrel and Deflected Beam-Film Rupture Tests

Laboratory heat aging tests on insulating varnishes can serve several purposes as follows:

a. Provide a means of identity and quality control.

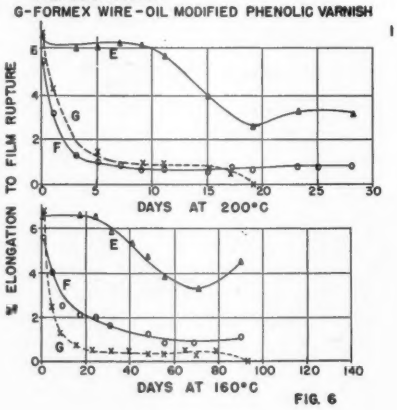

FILM RUPTURE
.0508 ROUND WIRE - 7 STRAND SAMPLE
E-HEAT RESISTANT WIRE ENAMEL-MODIFIED SILICONE VARNISH
F-HEAT RESISTANT WIRE ENAMEL-OIL MODIFIED PHENOLIC VARNISH
G-FORMEX WIRE-OIL MODIFIED PHENOLIC VARNISH
% ELONGATION TO FILM RUPTURE
DAYS AT 200°C
DAYS AT 160°C

FIG. 6

b. Provide a comparison between different varnishes.

c. Provide a basis for estimating life in service.

★ ★ ★

Since identity and quality control are not the subject of this paper, these important problems are not discussed. A means for comparing varnishes is important but the comparison should be functionally related to service requirements. Since in this case the service requirements is life at elevated temperatures, it is item (c) above which is important.

★ ★ ★

As previously mentioned, the method of Dakin (1), in which log life (in hours) is plotted against the reciprocal of the absolute temperature, has some theoretical rationality. In Figure 7, this method is used to compare the aging characteristics of three varnishes using both deflected beam-film rupture and the mandrel test. Results for static aging tests on ½" rods are also included. No mandrel test for the unmodified phenolic varnish D could be reported because this varnish could not be made to form good films for test in this way. From study of Figure 7, it is apparent that the deflected beam film rupture tests give results close to but somewhat more conservative than the static rod aging tests. The ⅛ and ½" mandrel tests result in comparatively rapid failure.

★ ★ ★

It still remains to be proven

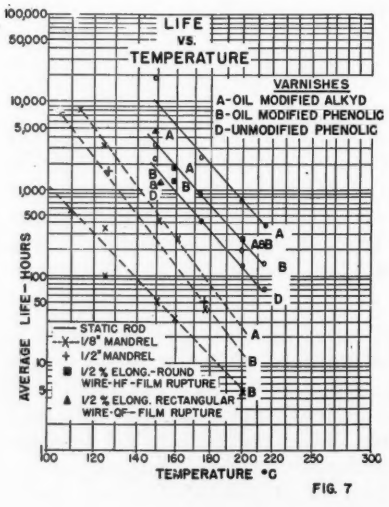


FIG. 7

whether or not the somewhat arbitrary assumption of ½% elongation as the end point for the deflected beam-film rupture test is significant. In Figure 8, results for one varnish, an oil-modified phenolic, are compared with small motor aging tests which have been described in part in a previous publication (3). It is reassuring to see how well the life-temperature data for wet and dry motors, brackets the data at ½% elongation. The results for the static rod aging test compare quite closely with the curve for dry motor insulation.

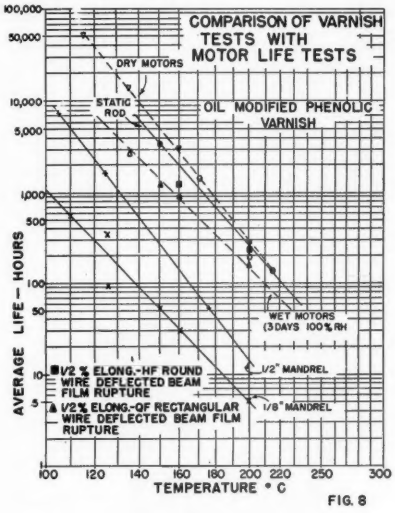


FIG. 8

Summary and Conclusions

Much more information about the aging characteristics of insulating varnishes can be obtained by following the changes in flexibility as heat aging progresses than by accepting one arbitrary end point such as failure over a ⅛" mandrel. Moreover, mandrel tests using smaller than about a one inch mandrel diameter elongate the varnish film so much that significant comparisons are impossible.

★ ★ ★

Tests using a ⅛ inch mandrel in fact appear to be so unreliable that it would seem wise to discontinue their use even for control or identification purposes and other methods should be developed instead.

★ ★ ★

Static aging tests such as those described for varnish coated brass rods are far more useful than mandrel tests, but probably give optimistic results.

★ ★ ★

Static tests are not characteristic of actual application in which varnish treated insulation systems are exposed to a variety of mechanical strains such as vibration and differential thermal expansion.

★ ★ ★

The deflected beam-film rupture test offers considerable promise of providing a means for evaluating varnishes at elongations of about ½% which seem significant when compared to tests on actual motors.

★ ★ ★

The deflected beam-film rupture test permits comparison of varnishes in combination with other insulating materials in a manner which represents actual use. It is believed that this ability to evaluate the heat aging characteristics of simple combinations of varnish with other insulating materials may at last provide a truly adequate basis for temperature classification by test.

★ ★ ★

References

1. "Electrical Insulation Treated as a Chemical Rate Phenomenon," T. W. Dakin, AIEE Trans., Vol. 67, Pt. 1, 1948.
2. "The Deflected Beam Film Rupture Test Applied to Sheet Insulation," H. I. Morgan and K. N. Mathes.
3. "Aging of Small Motor Insulation," K. N. Mathes, AIEE Trans., Vol. 71, Pt. 3, 1952.

Footnotes

[1] Large Steam Turbine-Generator Dept., Materials and Processes Laboratory, General Electric Co., Schenectady, N. Y.

[2] Tentative Methods of Testing Varnishes Used for Electrical Insulation (D 115-52T), 1952 Book of ASTM Standards, Part 4, p. 314.

[3] Specification for Varnish, Electrical-Insulating (For Electro-motive Equipment).

[4] The boldface numbers in parentheses refer to the list of references appended to this paper, see above.

[5] Formex is the General Electric trade name for a polyvinyl formal insulation.

TWO INTERESTING PLANT VISITS SCHEDULED FOR the SILVER ANNIVERSARY CONVENTION of THE WIRE ASSOCIATION

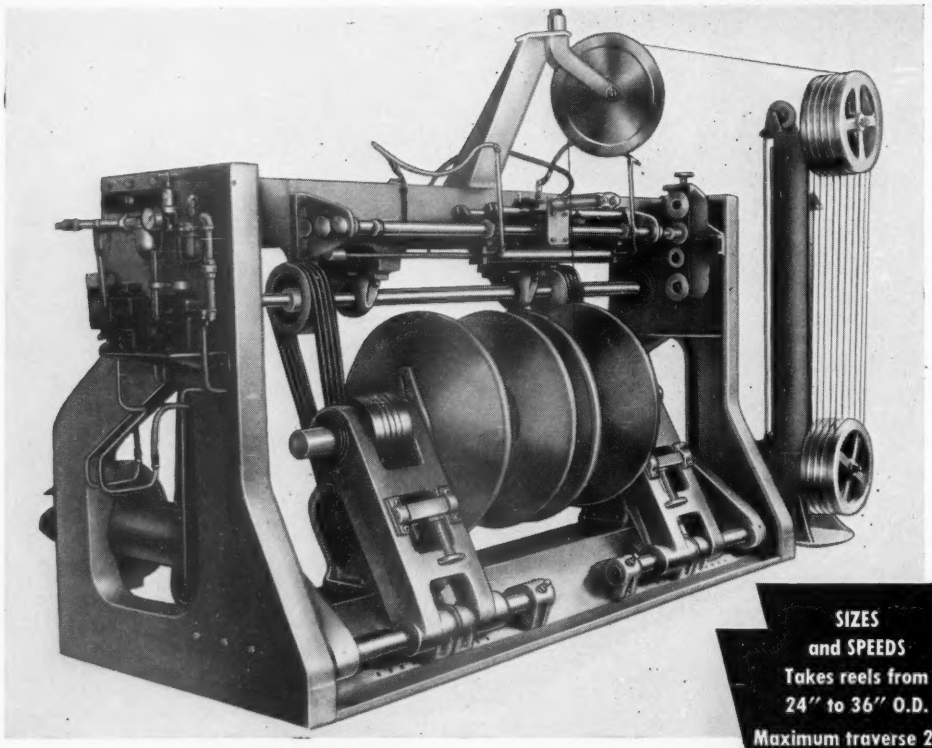
Both Ferrous and Non-Ferrous Sections of the Association are invited to take these plant visits jointly, which will take all day.

At 9 A.M. busses will leave the Statler Hotel for a visit to the die-making plant of The Carboloy Department of the General Electric Company in Detroit. Following the tour Carboloy will serve a buffet luncheon with their compliments.

At about 2 P.M. the group will arrive at Dearborn to visit the exhibits of the Ford Motor Company's Rotunda Building and to see the highlights of their Rouge Plant. This will include a tour of the steel making operations, the rolling mill, the press plant and, finally, the Dearborn Final Assembly Plant.

If you have not yet made arrangements to attend the Silver Anniversary Convention, write for a reservation card to THE WIRE ASSOCIATION, 453 Main Street, Stamford, Conn.

New REEL TAKE-UP
by DAVIS-STANDARD



SIZES and SPEEDS
Takes reels from 24" to 36" O.D.
Maximum traverse 25"
Speeds to 1600 ft./min.

AVAILABLE NOW . . .

New take-up will give you high-speed, vibration-free production . . . proved in 55 installations.

Features

- Free from vibration at all speeds. Reel handling — in, out, and traverse — is by air . . . effortless, positive, and precise.
- Reels handled at floor level to avoid damage from dropping.
- No gears or clutches. Reel drive by double V-belts. Complete clutch action without troublesome clutch.
- No cranky variable speed transmission. Tension and acceleration by magnetic coupling motor.
- Constant tension control at all speeds with efficient dancer control column.
- Automatic self-braking as reel lowers to floor.
- Arbor assemblies adjust for close clearance between any size reels for trouble-free cutover.
- New, simple, air actuated traverse reversing mechanism. Parts can't break if accidentally jammed.
- Unusually heavy and rugged construction.

DS

DAVIS-STANDARD SALES CORPORATION

14 Water Street Mystic, Connecticut

Sole selling agents for

THE STANDARD MACHINERY COMPANY

World's Largest Manufacturers of Custom-Built Extruding Machines

Johnson Steel and Wire Company Modernization Program

Some interesting background material for this article was supplied by Charles D. Johnson, founder of this wire producing unit and its president up to his recent retirement, in the Mordica Memorial Lecture delivered last November at the Annual Convention of The Wire Association and published in the January, 1954, issue of WIRE AND WIRE PRODUCTS. This paper carries on the story of the company from where Mr. Johnson left off.

The last word in die shops and the ability to design intricate special wire drawing machinery are two big factors making possible a plant improvement program at the **Johnson Steel and Wire Company** in Worcester, Mass.

★ ★ ★

This 27-year old specialty wire mill, located in the cradle of the wire drawing industry, is spending about $500,000 on a seven point modernization program that should be completed about October 15, 1954.

★ ★ ★

Joseph R. Carter, vice president-operations of this **Pittsburgh Steel Company** subsidiary, said costs were trimmed since Johnson Steel was able to engineer some of the new special wire processing equipment the company needed to improve its competitive position in the scramble for business.

★ ★ ★

Johnson Steel and Wire uses special equipment and special skills to produce a great range of custom-made specialty wires. The firm's products run the gamut from aircraft and armature binding wire, bobby pin wire, music spring wire and rope wire, to vacuum hose wire and flexible shaft wire, to name a few.

★ ★ ★

Buying rod as raw material, Johnson processes it into wire by patenting, cleaning, coating, drawing and finishing operations to reduce the rods to wire of the desired size and give the wire the physical and mechanical properties it needs to do specific jobs.

★ ★ ★

Since wire drawing is a key operation, Johnson Steel and Wire makes painstaking efforts to get the best obtainable tungsten carbide dies, through which the wire is drawn on fast, efficient machines that finish to very close tolerances.

Joseph R. Carter, vice president-operations, at the company's Worcester plant. Mr. Carter, who began his steel career during college vacations, worked in an open hearth shop, blast furnace department and rolling mill before he climbed to management ranks. * * * * * * * *

★ ★ ★

To maintain the supply and quality of finish in the dies it needs, Johnson Steel and Wire maintains a die shop equipped with the last word in die making machinery and staffed with about 25 skilled diemakers. The accurate dies produced in this shop, installed on both special machines made by Johnson employees and those bought outside, help the company produce its well-known quality in specialty wires.

★ ★ ★

The company's plant improvement program, which got underway in February of 1952, is more than two-thirds completed. Vice President Carter believes the program will substantially decrease production costs with no sacrifice in the high quality of the wire that the company seeks to maintain.

★ ★ ★

One good way to do that, company officials realized, was to replace old style bench blocks, which required manual material handling, with modern continuous wire drawing machines.

★ ★ ★

Here's the status of the seven-point improvement program:

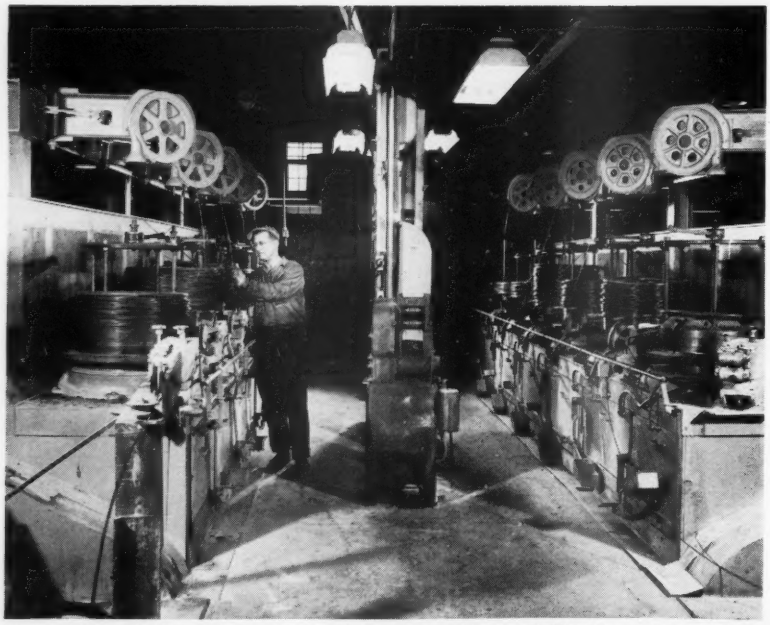
1. **Power is being increased 33 per cent. The company is installing a complete new substation with a 2,000 KVA capacity that will be company owned. It will provide half the plant's total power requirements. The result will be more electricity at cheaper rates.**

2. **New facilities to make the most economical use of natural gas which reached the city of Worcester and the plant in recent months. Plant furnaces and heat treating facilities have been converted to the use of both gas and oil. Gas is used only during the warm months when it is the most economical. Oil is burned during the coldest months. The result is a substantial saving in fuel costs.**

3. **Two new wire drawing machines with air and water cooled blocks now are in operation and producing large quantities of excellent quality wire. These new continuous drawing machines were engineered by Johnson workers using mechanical skills developed over a period of many years.**

4. **New Morgan seven block wire drawing machines were delivered to Johnson last January. These hard working machines are the latest in modern high speed equipment and can produce wire from .030 inches in diameter to .0625 inches.**

5. **A battery of new Vaughn Ringblox wire drawing machines also is in full operation after a period of intensive testing to determine the proper machine speeds and lubri-**



New specialty wire drawing machines, made by Johnson Steel and Wire Co., cut the costs in the company's seven-point improvement program.

cants for various types of wire. These intricate machines draw wire which measures .007 inches, only twice the size of a human hair, and up to .018 inches.

These machines use a series of 12 blocks, arranged in a circle or ring. Each of the blocks pulls the wire through a tungsten carbide die for the successive reduction drafts. The wire is drawn wet, immersed in a liquid soap solution to lubricate the wire.

6. Only engineering work has been done to date on the sixth part of the modernization program—replacing five present hot metal coating lines with three new lines. Construction of the new lines is expected to start soon. These hot metal coating lines are used to give wire one of the following coatings: zinc, tin or alloy.

7. Reconstruction of a tempering furnace to give the company what will amount to a brand new furnace has just been started. This job has now been completed. The new furnace will provide economies in operation and allow the company to compete for profitable business in more markets.

The improvements are expected to help by enlarging the market in which the company can operate profitably by virtue of lowered costs. It is anticipated that these cost reductions will allow the company to meet competition. The new equipment will let them produce a wider variety of high carbon steel specialties, which means a better diversification of products.

Johnson is making music spring wire in sizes from .003 to .207 inches and all other wires or finished sizes ranging from .003 to .091 inches.

★ ★ ★

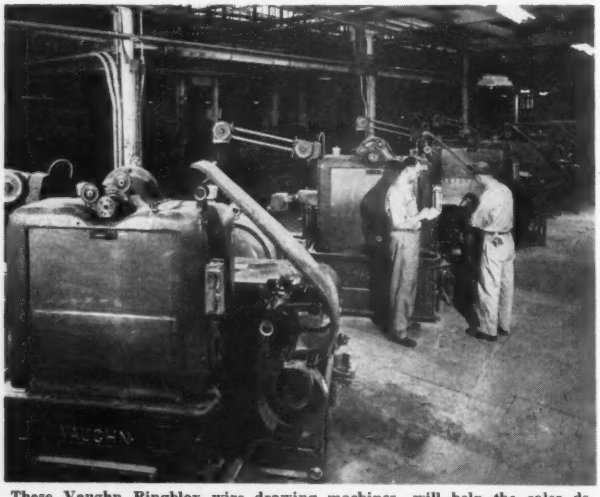
The company is presently making wire for at least 70 different industries, including the aircraft, automotive, rubber and electronic industries. Its products include fine surgical wire, bobby pins, heavy cables and dental instruments. Radar equipment takes wire so fine that it's hardly visible, while rope wire is used by Johnson customers to make heavy cables.

★ ★ ★

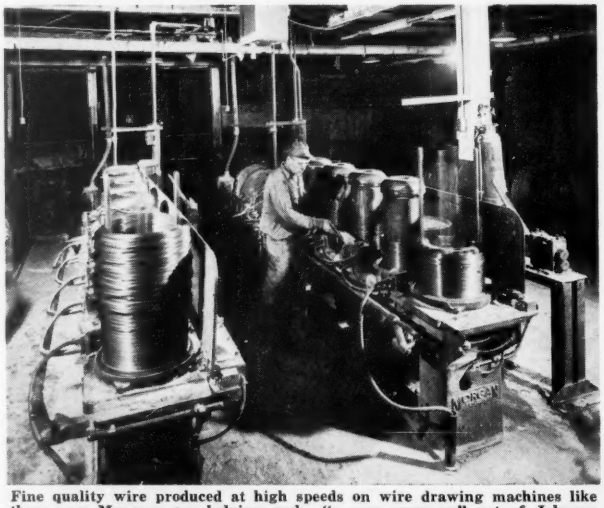
One of the products for which Johnson is best known is music spring wire, made from specially processed Swedish steel. Music wire is used principally for high grade springs found in everything from tractors to typewriters. Only a small part of this product is actually used in musical instruments.

★ ★ ★

Another of their well known products is tire bead wire for the production of which the company operates in Akron, Ohio, and Los Angeles, California, to assure good service to the rubber industry. Tire beads call for a wire with high tensile strength and ductility, so this wire is a hard drawn, high carbon steel, suitable for the anchor that holds the tire on the rim. Johnson pioneered the development and improvement of bead



These Vaughn Ringblox wire drawing machines, will help the sales department compete successfully in new markets by reducing costs and improving quality.



Fine quality wire produced at high speeds on wire drawing machines like these new Morgans are helping make "a new company" out of Johnson Steel and Wire.

Nothing finer!

A statement from
a conservative organization:

"Our records show that when a manufacturer once discovers the uniform quality of Roebling flat spring steel, he becomes a steady Roebling customer."

You, too, *pay* for the best spring steel... make sure you *get* it. Specify Roebling. John A. Roebling's Sons Corporation, Trenton 2, N. J.

ROEBLING

A subsidiary of The Colorado Fuel and Iron Corporation

S.S. United States . . . most modern, fastest liner afloat.

BRANCHES: ATLANTA, 934 AVON AVE. • BOSTON, 51 SLEEPER ST. • CHICAGO, 5525 W. ROOSEVELT RD. • CINCINNATI, 3253 FREDONIA AVE. • CLEVELAND, 13225 LAKEWOOD HEIGHTS BLVD. • DENVER, 4801 JACKSON ST. • DETROIT, 915 FISHER BLDG. • HOUSTON, 6216 NAVIGATION BLVD. • LOS ANGELES, 5340 E. HARBOR ST. NEW YORK, 19 RECTOR ST. • ODESSA, TEXAS, 1920 E. 2ND ST. • PHILADELPHIA, 230 VINE ST. • SAN FRANCISCO, 1740 17TH ST. • SEATTLE, 900 1ST AVE. S. • TULSA, 321 N. CHEYENNE ST. • EXPORT SALES OFFICE, TRENTON 2, N. J.

Fastest Process Annealing FOR COILED STEEL WIRE

- ✓ Annealing cycles accomplished in minutes rather than in hours
- ✓ 50% lower equipment cost
- ✓ less floor space
- ✓ no scale, decarburization, or other atmosphere effects

On-the-job production figures prove that no other method compares with an Ajax Electric Salt Bath Furnace in speed, uniformity, cost saving, and general all-around efficiency in process annealing all types of steel wire as well as aluminum, copper alloys, and silver alloys.

Heating cycles are far faster. Absolute uniformity is assured. Thanks to the exclusive Ajax electrodynamic stirring action, the temperature does not vary more than ±5°F. *in any part of the bath.*

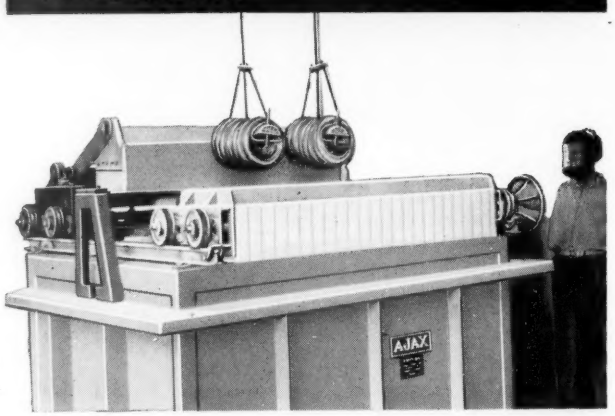
The Ajax Salt Bath eliminates all atmosphere with its accompanying problems of oxidation, pitting, and decarburization. Preservation of metal surface is assured. Equipment cost is much lower —and the Ajax handles more work for a given amount of floor space than any other method. Ajax Reprints 62 and 63 gladly sent on request.

LOW- AND HIGH-CARBON STEELS

This typical Ajax installation process anneals 1200 lb. 18-gauge wire an hour in only 58 feet of floor space.

STAINLESS STEEL

Annealing fine gauge nickel-chromium wire at 1950°F. Clean wire surface eliminates conventional pickling operations.



- **TOPS for WIRE PATENTING, too!**
- **IDEAL FOR DESCALING** hot-rolled stainless and alloy steel wire and other shapes employing either the Dupont sodium hydride or the Hooker Electrochemical Virgo bath.

Associate companies: Ajax Electric Furnace Corp. • Ajax Engineering Corp. • Ajax Electrothermic Corp.

AJAX electric SALT BATH furnaces

OVER 4,000 INSTALLATIONS . . . more than all other salt baths combined

AJAX ELECTRIC CO., Inc., 928 Frankford Ave., Philadelphia 23, Pa.

wire and was a big factor in eliminating the tire bead failures that plagued early tire manufacturers.

★ ★ ★

Manufacturing activities here involve five major operations: patenting, cleaning, coating, drawing and finishing. Before some wire is shipped it may go through the entire series of operations five times.

★ ★ ★

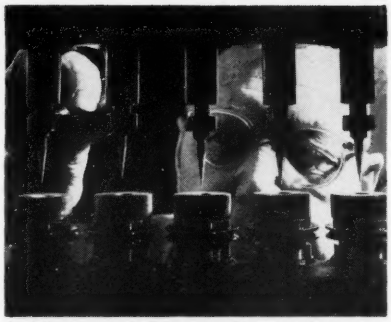
Rods in coils weighing 200 to 400 pounds are the raw material. Incoming shipments of rods are checked for chemistry, physical characteristics and surface quality. Music spring wire, as previously stated, is made from rods produced in Sweden. Large quantities of fine Swedish steel are imported each year by Johnson Steel and Wire.

★ ★ ★

Uniformity, a prime necessity in the production of wire, begins in the patenting furnace. In this continuous operation, the wire is immersed in a bath of molten lead to the point where the grain structure begins to change—1,600 to 1,800 degrees Fahrenheit. It is then subjected to controlled cooling to a temperature below the transformation range. This cooling is done at Johnson in a bath of molten lead of about 1,000 degrees Fahrenheit, a temperature appropriate to the desired carbon content and physical properties of the finished product. This heat treatment gives the wire extreme toughness combined with high ductility and provides the qualities needed for the cold working that follows in the wire drawing machines.

★ ★ ★

In the Cleaning Department, rods and wire are cleaned in a modern, straight-line pickling installation. Incoming rods are dipped in sulphuric acid which loosens and removes most of the scale. A muriatic acid dip then removes any remaining scale. Two rinses are given the steel to remove acid and the material is then ready for lime coating. Rods and wire can be given a coating of lime or any of its commercial substitutes and then baked or air-dried. The purpose of the coating is to



A skilled worker in the Die Shop, adjusts one of the machines used to drill dies. * * * * *

make the wire drawing lubricant adhere to the steel and form a compound which helps the wire slip through the die. Baking, in addition to drying the coating, helps eliminate hydrogen embrittlement.

★ ★ ★

Wire, now ready for drawing, may go on the new Johnson continuous drawing machines. On these machines, the wire is drawn through the dies, finishing in sizes from .091 to 0.54 inches. New Morgan seven block (seven die) machines finish wire from .0625 inches to .030 inches. A battery of new Vaughn Ringblox drawing machines draw wire to sizes ranging from .018 to .007 inches. These new machines can operate at speeds in excess of 2,000 feet per minute.

★ ★ ★

The wire may be coated by hot dipping or by chemical action. On the metal coating lines, 12 strands of wire can be handled simultaneously. Following acid cleaning, the wire goes into a plating tank to coat the wire. A water rinse and drying pan are near the end of the line, where some wires also get a corrosion resistance covering. Finally it is straightened and wound on spools or into coils.

★ ★ ★

Finishing operations vary according to the type of wire and the customers' specifications. Wire for bobby pins, for example, is flattened from the round. Other wire may be crimped or oil tempered. A variety of coated finishes can be given wire, including bright and liquor finish, in addition to zinc or other metal coatings.

★ ★ ★

Vital to all drawing operations is the tungsten carbide die. The exacting finish of these dies is an indication of the care taken to produce quality wire. Using jewelers' eyepieces and microscopes, the diemakers can pierce a tungsten carbide blank or "nib" with a hole as fine as one-thousandth of an inch, finer than a human hair.

★ ★ ★

Over 100,000 dies are kept in stock. Each may be recut as many as 50 times during its useful life. The die shop can grind 500 dies on a normal day and has ground as many as 1,000 in one day.

★ ★ ★

The shop uses several hundred dollars worth of powdered diamond compound a month in its grinding work, which serves as an abrasive for the cutting and polishing of the die's drawing surfaces. This compound is so valuable that it is kept under lock and key and cotton waste used to wipe off excess material is sent back to the manufacturer so that the diamond powder may be reclaimed and reused.

★ ★ ★

Finished wire is tested to assure top performance on production lines. In testing, it is deformed in almost every way possible to show up defects. This includes torsion, tensile, elongation, swaging, wrapping, bend, fatigue, hook and eye, coil, cast and other testing. Every coil is tested for properties the wire should have for its ultimate application. Fine wire and specialty wires receive many of these tests at each end of the coil. In this way it is expected that every coil or spool of wire shipped will meet all of the wire's quality requirements and by a safe margin.

★ ★ ★

Once the wire has passed inspection, it is packed for shipment. Bundles and spools are wrapped and re-wrapped to resist corrosion. According to customer specifications, they are packed in plywood drums, steel drums, or shrouded and banded in wooden pallets. Spools are wrapped in Vapor Phase Inhibitor paper. This same paper is used inside drums, as is Silica Gel, to remove moisture from the air. Every precaution is taken to guarantee that the tested wire reaches the customer in as good

(*Please turn to page* 1034)

Silicone Insulated Cable Practice

by H. T. Armitt
Research Laboratory
The Okonite Company
Passaic, New Jersey

This paper was presented at the Signal Corps Second Annual Symposium on Wire and Cable at Asbury Park on December 15, 1953, and is published by permission of the author.

One of the most significant developments in recent years in the field of insulating materials has been the use of silicone rubber as a dielectric for wire and cable. The great increase in the use of electronic and electrically controlled equipment exposed to rigorous temperature requirements for industrial and military purposes has contributed materially to the development of this type insulation, which is capable of operating over a very wide temperature range. Silicone rubber provides the answer to many cable problems where exposure to temperatures in the range of -55°C to 200° C are involved. The wide range of temperature stability of silicone rubber results from its chemical structure, a silicon-oxygen linkage which, unlike the carbon to carbon linkage of natural or synthetic rubber is not subject to oxidation and deterioration at high temperatures. This contrasts with the carbon to carbon atom linkage in the other insulations which retain a certain degree of unsaturation after vulcanization, causing melting or hardening at temperatures above 100°C.

★ ★ ★

Since 1946, when our first experiments were made with silicone insulated cable our methods and processes in handling silicone rubber have undergone great modification. We have learned, often by trial and error, that certain procedures in the extrusion and vulcanization of silicone rubber insulated cables are necessary to produce the optimum physical and electrical properties in the end product.

★ ★ ★

Silicone rubber may be compounded from the silicone gum and thus "tailored" for a specific cable application or it may be purchased in the compounded form and used without further treatment. In either case, extreme care must be taken during every process in the handling of this material. Unless precautions are observed, foreign particles, lint, etc., will quickly adhere to silicone rubber in its unvulcanized form as it is soft and somewhat tacky. Clean conductors, a clean mill and a clean extruder together with personnel trained in all the rules of sanitary handling of silicone rubber are essential.

Extrusion

The conductor used in the manufacture of silicone insulated cable is electrolytically cleaned and in the case of bare copper, the conductor is then wiped with carbon tetrachloride and a paper wrapping is applied over the outer turns of the conductor as protection in transit before the reel proceeds to the next department. In the case of coated conductors, the paper wrapping is applied as soon as the reel is removed from the take-up and immediately prior to transfer. All conductor sizes are wound on large, clean wooden reels to prevent kinking, cross-overs or other conditions which would interfere with the smooth unwinding of the conductor at the extrusion machine.

★ ★ ★

In addition to the cleanliness precautions taken with the conductor, the mills and extruding equipment are also cleaned thoroughly before beginning operations. A two-roll mill is used to soften and prepare the silicone rubber for the extruder and this equipment is carefully washed down with carbon tetrachloride and dried with clean rags, especial attention being given to crevices and corners at the end plates where bits of material used on previous mill batches may collect. The silicone rubber is milled for about five minutes on a cool mill and the entire batch is then removed in strips approximately 4″ x 36″ x ⅜″ ready for feeding into the hopper of the extrusion machine. The extruder is likewise thoroughly cleaned by removing the worm and swinging the head open so that all parts may be washed with rags soaked in carbon tetrachloride and wiped dry with clean rags. Threaded sections and small crevices are cleaned first with stiff brushes to remove all particles which tend to lodge in these places.

★ ★ ★

Silicone rubber may be extruded and vulcanized in separate operations or it may be extruded by the continuous vulcanization (CV) method. In the first named method, before entering the extrusion machine the conductor is wound in a single turn around a driven capstan to provide an even tension. The extrusion head is operated without any heat circulation and with a small amount of cooling water allowed to circulate through the head. This tends to reduce the frictional heat in the head as the silicone rubber is worked around the worm and in the head itself. The temperature of the stock in the extrusion head is kept to a maximum of 120°F throughout the length of a production run by adjustments of the valve controlling the admission of cool water to the head. A small gas flame is directed at the exit of the tubing machine head in

order to keep the diameter of the extruded wire within the desired tolerances. The gas flame at the point where the insulated conductor leaves the core and die smooths out any temperature variations which might occur due to frictional heat and keeps the insulation at a constant temperature. No screens are used but a single breaker plate with six one-quarter inch diameter holes equally spaced around the circumference of the plate is used. The function of this plate is to prevent surging or periodicity in the diameter of the extruded wire as it permits only the relatively small amount of compound necessary to form around the conductor to pass at a uniform rate. A bleeder valve adjusted to the amount of compound being extruded also helps to maintain uniformity. Cores and dies used in the extrusion of silicone rubber are conventional rubber tools adjusted so that the compound thrust pushes the wire out at the desired diameter. Extrusion speeds of 100 ft. per minute have been obtained for cable sizes up to .250" diameter and slightly less for the larger sizes.

★ ★ ★

The diameter of the extruded cable as it leaves the extruder normally exceeds the diameter of the vulcanized cable by several mils. On a No. 14 AWG, 7 strand, copper conductor, for instance, where it is desired to apply a nominal 3/64" wall of insulation the final vulcanized diameter would be .167". The diameter of the cable, however, as it left the extruder would be approximately .172", a difference of 2.9%. The vulcanizing process reduces the extruded diameter of the cable by approximately 3 to 8%. Where the walls of silicone rubber are very heavy a greater tolerance is allowed but even on the largest walls the difference rarely exceeds fifteen mils.

★ ★ ★

As it leaves the extruding machine the silicone insulated cable enters a reservoir of talc (aluminum-magnesium silicate) where it acquires a coating of this finely divided material which prevents the silicone insulation from adhering to itself or other surfaces and acts as a lubricant. As it leaves the talc reservoir the cable is wound a full turn around a capstan which provides a light but steady tension on the cable. This tension must be very carefully adjusted so that the thrust of the material as it leaves the extruder is not either retarded or accelerated, in order to prevent distortion. The cable is then fed to an overhead sheave and is guided down into a talc-filled pan, ready for curing or vulcanizing.

★ ★ ★

The continuous vulcanization method of extruding silicone rubber follows in general the same pattern of careful handling and cleanliness observed with the first method. When the insulated conductor leaves the extruder, however, it enters directly a chamber or tube, 100 feet long, maintained at a steam pressure of 225 lbs. and passes through the chamber at a pre-determined rate, usually about 200 ft. per minute for small wire in order to produce the optimum degree of vulcanization for the wall thickness and the conductor size being run.

★ ★ ★

Spark testing of the insulation is performed after the wire has left the vulcanizing tube but before it is wound on the take-up reel. This spark test merely serves to warn the operator of any defects in the extrusion set up or in the rubber itself. A second spark test is applied later and the wire is repaired at that point. After extrusion the reel is then allowed to remain in an oven maintained at a temperature of 212°F for forty-eight hours. This conditioning process permits the insulation to dry thoroughly as the residual moisture on the surface of the insulation is driven off, and of equal importance undesirable by-products of vulcanization are also removed. Some degree of further vulcanization is also obtained with the two day period in the oven as evidenced by physical test values taken before and after the conditioning, as well as by insulation resistance values obtained in the same manner.

★ ★ ★

Vulcanizing

When silicone rubber is extruded and cured in separate operations, the pans of insulated wire are delivered to the curing oven in a stack of not more than six pans. The insulated cable is wound in even layers in the pan with a deep bed of talc between layers to act as a cushion. Each pan contains from 500 ft. to 3000 ft. of cable, depending upon the diameter of the cable. Except in the case of very light diameter cable not more than three layers are placed in a pan in order to prevent possible denting and distortion of the soft unvulcanized compound.

★ ★ ★

The temperature of the curing oven is increased automatically from room temperature to 482°F over a period of twenty-four hours. Air, drawn in and heated by electrical elements, is circulated within the oven by means of a series of ports ranged along the inside of the walls of the oven to assure even distribution of heat. Provision is made also to vent gaseous products of vulcanization to the outside atmosphere. The rate of rise in temperature is controlled to prevent blowing or bubbling, particularly in the early stages of the curing cycle, when this type of fault is most likely to occur.

★ ★ ★

The pans of wire are allowed to remain in the oven at 482°F for a definite period of time which is determined by the amount and size of the cable in the pans. Six pans of small diameter lead wire, for instance, would remain in the oven for thirty to forty-five minutes, cables with larger diameters may remain for periods ranging up to three hours at the maximum temperature. This type of cure in which a period of gradual increase of temperature is followed by a shorter period at the maximum temperature may be altered by use of an intermediate cure. By the latter method the pans of cable are given an initial cure in a steam vulcanizer placed in an air oven for a final curing period to obtain the requisite physical and electrical properties.

At the end of the vulcanizing period the oven heat is turned off and the pans removed and allowed to cool. The cable is removed from the pans through continuous spark testing equipment and any repairs necessary are made at this point. Repairs are made by personnel specially trained in the technique of splicing silicone rubber cables. After the cable has been spark-tested repaired and rewound, the reels are placed in a tank of water for A.C. voltage and insulation resistance tests. The ends of the cable are suspended in the air so that there is about 24 inches between the water level and the cable ends prepared for testing. The remainder of the cable on the reel is completely immersed for at least one hour before the A.C. test voltage is applied, followed immediately by an insulation resistance test. The reel of cable is then removed from the tank and allowed to drain thoroughly before it is sent to the next department.

★ ★ ★

The coverings or jackets usually used in conjunction with silicone rubber insulation are glass or asbestos braids, although by no means confined to these materials. Both glass and asbestos braids, however, offer the high temperature resistant properties necessary in order that every component of a silicone insulated cable conform to the temperature requirements associated with this type cable. Other materials that have been used as coverings are lead, interlocked metal armor and neoprene. In the latter case, one customer required a neoprene jacket for a severe scuffing and oil resistant section of the cable installation, while the cable ends were subject to very high temperatures. The customer removed about six feet of the neoprene jacket at both ends and thus obtained the desired features in the cable installation at the places they were needed most.

★ ★ ★

Where glass braids or asbestos braids are used a high temperature varnish or lacquer is also used to prevent fraying and to cement down the fibers of these materials. A silicone resin lacquer is the most commonly used material for this use.

★ ★ ★

To date some of the best electrical grades of silicone rubber have shown some notch-sensitivity. In the wire and cable field particularly, this characteristic is cause for much concern. However, improvements have been made lately resulting in tougher grades of silicone rubber with good physical properties and it is hoped that with some of the better reinforcing materials even further advances may be made in this direction in the future.

★ ★ ★

Silicone rubber is unaffected by corona discharge and is extremely resistant to outdoor weathering. In addition it is possible to obtain silicone rubber with a brittle point in the range of -70° to -100°F. It is particularly important in military applications that wire and cable components function at both temperature extremes and in this respect silicone offers important advantages to the cable manufacturer.

★ ★ ★

Dielectric strength testing of silicone insulated cables has proved to be slightly erratic on certain sizes to date which we feel may be closely tied in with the type of cure as related to the wall thickness of the insulation and we are continuing our investigations on this subject.

★ ★ ★

In addition to the usual cable constructions in which silicone rubber is used such as ignition cable, lead wire, control cable, etc., the advantages of this material with respect to temperature stability have led us to attempt to utilize it in other constructions.

★ ★ ★

The first of these constructions consisted of No. 14 AWG, 19 strand tinned copper conductor with a wall of silicone rubber to .390 and a layer of .0063 tinned copper braid overall. It is felt that by actual service evaluations on this cable it may be possible to design a high voltage type cable using silicone rubber insulation.

★ ★ ★

Measurements of dielectric constant vs. frequency on this type cable indicate a value of 3.2 and that this figure remains substantially the same over a range of frequency from .5 MC to 5.0 MC. The power factor, however, increases approximately 160% over the same range of frequency (Fig. 1) and although the increase is large proportionately, the total change is in the low range since the power factor at .5 MC is .0015 while at 5.0 MC it is only .0039. The values agree in general with data furnished by the supplier of the silicone rubber wherein it is

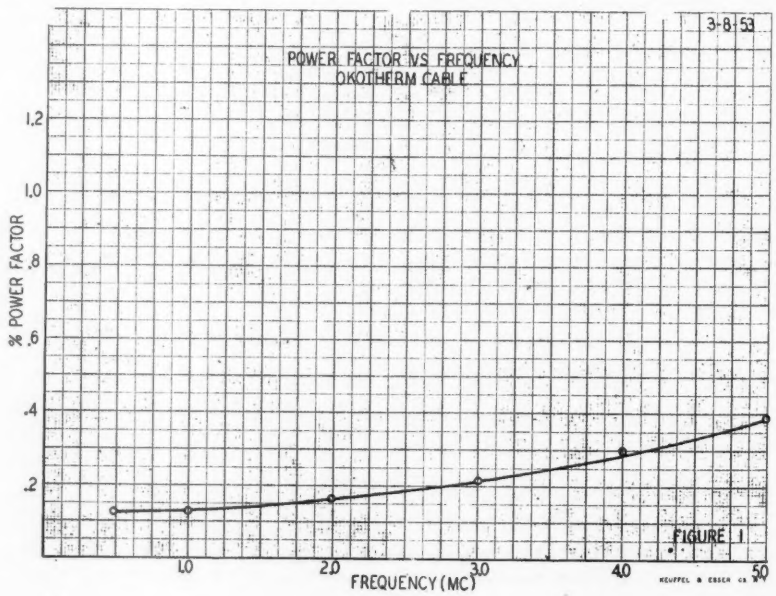


FIGURE 1

stated that in the frequency range of 100 cycles to 1 MC the increase in power factor is approximately 200% or from .00096 to .0028.

★ ★ ★

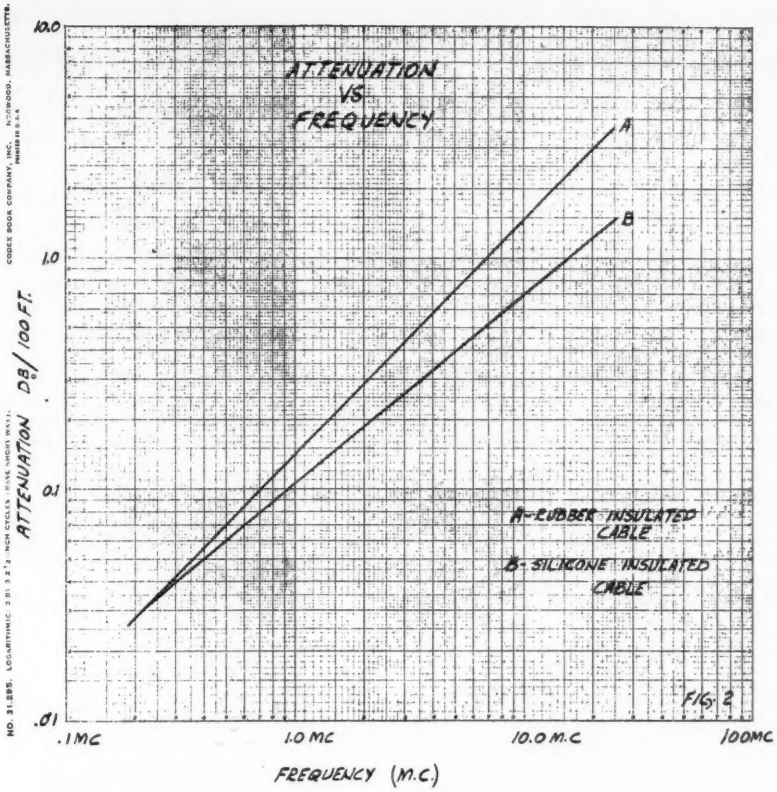
The second of these constructions is a high power, twenty-five ohm pulse cable with a diameter over the silicone insulation of one inch. This cable design is discussed in greater detail in Signal Corps Development Contract entitled, "High Power, Low Noise Pulse Cable." This development work is under the auspices of the Squier Laboratory.

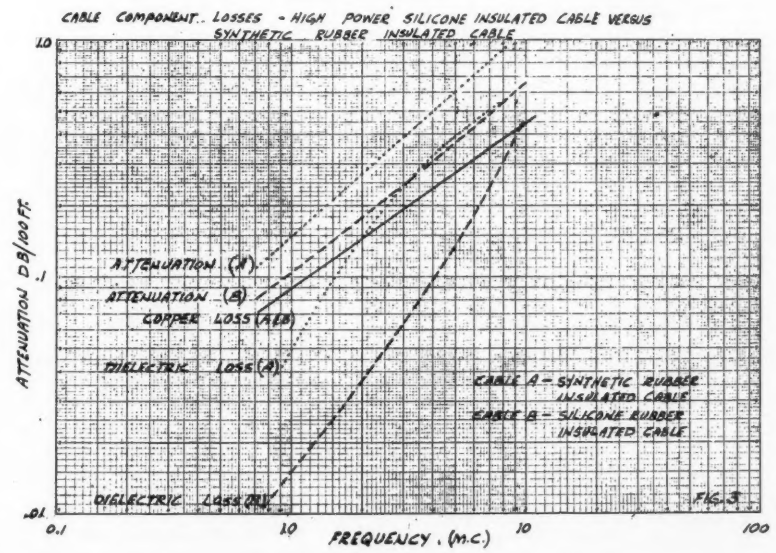
★ ★ ★

Figure 2 shows the relationship between attenuation and frequency over a range of .1 MC to 25.0 MC on a synthetic rubber insulated cable (A) compared with a silicone insulated cable (B). The lower dielectric loss of the silicone insulated cable may be attributed to the lower power factor of this material over the frequency range shown and indicates that in the lower frequency ranges particularly silicone insulation shows promise of more extensive use in cables where stability over a wider temperature range is desired.

★ ★ ★

Figure 3 compares the component losses of two similar cables, one using a synthetic rubber insulation (A) and the other a silicone rubber insulation (B). The copper loss for these cables may be considered the same as shown by solid line. It is evident from these measurements that silicone insulation offers some advantage in the frequency range of 1.0 to 10.0 MC in that it has less of a loss factor than comparable insulation made with synthetic rubber to operate in the same temperature range.





Have You Made Arrangements To Attend the SILVER ANNIVERSARY CONVENTION of The Wire Association?

Turn to pages 982 through 985 for the program details. It will pay you to be in Detroit on November 8-11. Write for a hotel reservation card, if you didn't get one.

THE WIRE ASSOCIATION

453 MAIN STREET — Richard E. Brown, Executive Secretary — STAMFORD, CONN.

THE ANNUAL CONVENTION OF THE WIRE ASSOCIATION

STATLER HOTEL, DETROIT, MICH., NOVEMBER 8-11, 1954

The Wire Association's Headquarters at The Statler Hotel
will be open from Monday, November 8th, every evening during the Convention.
Come and get acquainted.

THERE WILL BE A REGISTRATION FEE OF $11.00 FOR MEMBERS AND $13.00 FOR NON-MEMBERS, INCLUDING AN ANNUAL LUNCHEON TICKET, FOR ALL THOSE ATTENDING THE TECHNICAL SESSIONS AND MEETINGS.
PLEASE HAVE YOUR ASSOCIATION MEMBERSHIP CARD WITH YOU AND SHOW IT WHEN REGISTERING.

ADMISSION WILL BE BY BADGE ONLY—PLEASE WEAR IT.

THE WIRE ASSOCIATION PROGRAM COMMITTEE FOR THE 1954 CONVENTION

GENERAL CHAIRMAN
A. Earl Glen, Mgr., Die & Wear Part Sales
Carboloy Dept., General Electric Co.
Detroit, Michigan

GENERAL ACTIVITIES

EXECUTIVE SECRETARY
Richard E. Brown
The Wire Association
Stamford, Conn.

REGISTRATION
R. S. Spengel, Asst. Exec. Secy.
The Wire Association
Stamford, Conn.

ENTERTAINMENT
Eber J. Hubbard, President
Hubbard Spool Company
Garrett, Ind.

All papers presented at the Convention by members of The Wire Association are eligible for consideration for the Annual Medal Award, and will be voted upon by the Board of Directors at the next Spring meeting of that body.

FERROUS DIVISION

CHAIRMAN
Raymond S. Worth, Mfg. Manager
Wire Mills Division
John A. Roebling's Sons Corp.
Roebling, N. J.

COMMITTEE MEMBERS
H. J. Godfrey
Chief Development Engineer
John A. Roebling's Sons Corp.
Trenton, N. J.

R. H. Hertzog
Metallurgical Engineer
John A. Roebling's Sons Corp.
Wire Mills Division
Roebling, N. J.

Technical papers are preprinted in the October issue of Wire and Wire Products insofar as possible. Titles to papers accepted will be given to The Wire Association and duly copyrighted at the time of publication.

NON-FERROUS DIVISION

CHAIRMAN
James E. Flood, Chief Chemist
Plastic Wire & Cable Corporation
Jewett City, Conn.

COMMITTEE MEMBERS
Andrew Pudlak, Field Engineer
Copperweld Steel Corporation
Glassport, Penna.

Grayson B. Wood, Jr., Metallurgist
Scovill Manufacturing Company
Waterbury, Conn.

Glenn J. Moher, Manager of Methods
Wire and Cable Section
Canadian General Electric Co., Ltd.
Peterborough, Canada

All wire mill men and wire mill suppliers are invited to attend this convention, see how the Association functions and participate in the activities.

Hotel reservations should be made by members of the Wire Association direct to the Secretary.
MAKE YOUR PLANS NOW TO ATTEND AND SEND YOUR RESERVATION PROMPTLY

MONDAY, NOVEMBER 8th

9:00 A.M.
REGISTRATION

10:00 A.M.
DIRECTORS' MEETING

12:30 P.M.
PROGRAM COMMITTEE LUNCHEON

TUESDAY, NOVEMBER 9th (cont'd)

AFTERNOON SESSION—2:00 P.M.

FERROUS SECTION

CHAIRMAN OF MEETING

Frederick W. Leslie, Supt., G. F. Wright Steel & Wire Co., Worcester, Mass.

PAPER: "Prestressing Wires-Stress-Relaxation and Stress-Corrosion Up to Date."	Latest information and Importance of protection against corrosion accented.	by Gordon T. Spare, Research Project Engineer American Steel & Wire Div. United States Steel Corp. Cleveland, Ohio
PAPER: "Phosphate Coating of Steel Wire."	How phosphate coatings function and their advantages are covered in this paper.	by James S. Leland, Engineer Parker Rust Proof Company Detroit, Mich.
PAPER: "Acid Cleaning of Stainless Steel."	Stainless steel is not an easy-to-handle metal and this paper adds to the understanding of its proper cleaning.	by John H. Corson, Director of the Laboratory Carpenter Steel Co. Reading, Pa.

NON-FERROUS SECTION

CHAIRMAN OF MEETING

Andrew Pudlak, Field Eng., Copperweld Steel Co., Glassport, Pa.

PAPER: "Magnet Wire Coatings."	Discussion of coatings for magnet wire.	by Dr. J. A. Loritsch, Mgr. Alkyd Products Eng. Chemical Materials Div. General Electric Co. Schenectady, N. Y.
PAPER: "Processing of Titanium Wire." (tentative)	Increased production and uses of this metal have broadened the number of uses and interest in this wire.	by A Member from Rem-Cru Titanium Corp. Midland, Pa.
PAPER: "Composite Wires by Electroplating."	A discussion of composite metals and the manufacture of composite wires.	by Edward G. Slick, Supervising Engineer Sylvania Electric Products Warren, Pa.

WEDNESDAY, NOVEMBER 10th

MORNING SESSIONS—9:30 A.M.

FERROUS SECTION

CHAIRMAN OF MEETING

Glenn R. Lee, Wire Mill Supt., Continental Steel Corp., Kokomo, Ind.

PAPER: "Cooling of Steel Wire in Drawing."	Report on investigation of effect of air volume and finishing speed on wire temperature rise and physical property.	by Norman A. Wilson, Asst. Director of Research Morgan Construction Company Worcester, Mass.
PAPER: "Continuous Wire Drawing and Packaging."	This new process has expanded beyond original concepts. Principles explained and new fields of application outlined.	by Wm. H. Richardson, Vice Pres. The Driscoll Wire Co. Shelton, Conn.
PAPER: "Making of Shaped Dies by Electrical Discharge Process"	Discussion of the process followed by a demonstration of carbide die cutting.	by H. V. Harding, Tech. Asst. to Pres. Elox Corp. Detroit, Mich.

NON-FERROUS SECTION

CHAIRMAN OF MEETING

Grayson B. Wood, Jr., Met., Scovill Manufacturing Co., Waterbury, Conn.

PAPER: "The Application of Wire and Cable to Wire and Cable Mills."	Deals with the peculiarities of wire and cable power loads, drives, etc., as they affect the choice of wire and cable feeding the various types of mill machinery.	by Phillip J. Croft, Chief Engineer Canada Wire and Cable Co. Ltd. Toronto, Can.
MOTION PICTURE	A sound-color picture depicting: "Copper, Mined to Finished Products."	Shown through the courtesy of the Canada Wire and Cable Co., Toronto, Can.

THE CONVENTION PROGRAM

STATLER HOTEL, DETROIT, MICH., NOVEMBER 8-11, 1954

MONDAY, NOVEMBER 8th

9:00 A.M. Registration Desk opens on the mezzanine floor.

10:00 A.M. Annual Meeting of the Board of Directors of the Wire Association.

12:30 P.M. Directors' Luncheon for Program Participants.

AFTERNOON SESSION—2:00 P.M.

Joint Technical Meeting for Both Ferrous and Non-Ferrous Groups.

CHAIRMAN OF MEETING

John H. Richards, Jr., Chem. Eng., Apex Alkali Products Co., Philadelphia, Pa.

Address of Welcome by Leonard C. Crewe, Jr., Pres., Maryland Fine & Specialty Wire Co., Cockeysville, Md., President of The Wire Association.

SYMPOSIUM ON WIRE DRAWING LUBRICANTS

PANEL MEMBERS

Dr. Gray Verner, Technical Director Standard Industrial Compounds Co. Chicago, Ill.	Leon Salz, Mgr. Lubricants Div. Magnus Chemical Co. Garwood, N. J.	A Member from Apex Alkali Products Co. Philadelphia, Penna.

Panel members will discuss wet and dry drawing lubricants for ferrous and non-ferrous wires and will welcome questions and comments from the floor following their presentations.

PAPER: "Quality Control in the Wire Industry."	Control limit calculations and modified method compared with new method found successful in job-shop quality control installations.	by Axel U. Sternlof, Div. Product Eng., Electrical Cable Works American Steel & Wire Div. U. S. Steel Corp. Worcester, Mass.

TUESDAY, NOVEMBER 9th

FERROUS SECTION

MORNING SESSIONS—9:30 A.M.

CHAIRMAN OF MEETING

H. Clark Smith, Jr., Supt., Heavy Wire Div., Wilbur B. Driver Co., Newark, N. J.

PAPER: "Effect of Coiling Temperatures of Hot Rolled Rods on Scale Formation and Rod Surface."	Temperature of rods at finishing has direct bearing on scale and the problem of removing it.	by Robert A. Stebbins, Asst. Supt. Rod and Wire Div. Bethlehem Steel Co. Johnstown, Pa.
PAPER: "Application of Salt Baths in Processing of Wire."	Growth of use of salt baths in the wire industry makes this discussion of applications timely.	by Leon B. Rosseau, Vice Pres. Ajax Electric Company Philadelphia, Pa.
PAPER: "Continuous Patenting, Cleaning and Coating of Steel Wire."	A rope manufacturer's point of view on the processing of wire to achieve uniform quality.	by Donald K. White, Foreman #2 Wire Mill John A. Roebling's Sons Corp. Trenton, N. J.

NON-FERROUS SECTION

CHAIRMAN OF MEETING

Glenn J. Moher, Mgr. of Methods, Wire & Cable Section, Canadian General Electric Co., Peterborough, Can.

PAPER: "Rigid and Semi-Rigid PVC Insulations."	Properties of these materials and their applications to electric conductors, based on recent laboratory developments.	by J. L. Foster, Product Engineer Plastic Materials B. F. Goodrich Chemical Co. Cleveland, O.
PAPER: "Dry Blending"	Recent developments in dry blending and effects on wire coating properties.	by Milton S. Greenhalgh Construction Materials Division General Electric Company Bridgeport, Conn.
PAPER: "Automotive Wiring for New 12 Volt Systems."	Changes in the voltage of batteries require new types of wires-described in this paper.	by H. R. Hartzell, Asst. Chief Engineer Delco-Remy Div., General Motors Corp. Anderson, Ind.

WEDNESDAY, NOVEMBER 10th (cont'd)

AT 1:00 P.M. — THE ANNUAL WIRE ASSOCIATION LUNCHEON

LADIES WELCOME

The Mordica Memorial Lecture
by Carl E. Johnson, Supt., Rod & Wire Mills, Bethlehem Steel Co., Sparrows Point, Md.

LADIES WELCOME

THE PRESENTATION OF AWARDS FOR 1953

MEDAL AWARD: To Vito J. Vitelli, Process Engineer, Metallurgical Engineering Dept., Steel Wire Mills Div., John A. Roebling's Sons Corp., Trenton, N. J., for the most meritorious paper—"The Drawing of Shaped Steel Wire."

CERTIFICATE OF HONORABLE MENTION: To Dr. F. R. Morral, Head, X-Ray Dept., Div. of Metallurgical Research, Kaiser Aluminum and Chemical Corp., Spokane, Wash., and Dr. F. A. Schaufelberger, Chemical Construction Corp., New York, N. Y., for the best ferrous paper—"Molten Salts for The Wire Industry."

CERTIFICATE OF HONORABLE MENTION: To F. W. Wurtzell, W. J. Canavan and B. H. Maddock, Development Engineers, Bakelite Company, New York, N. Y., for the best non-ferrous paper—"A Review of Fluorothene in the Wire and Cable Industry."

AT 4:00 P.M.—THE ANNUAL MEETING OF THE WIRE ASSOCIATION

This is the annual business meeting of members of the Association. Your personal attendance is needed and urged.

Chairman of Meeting
Leonard C. Crewe, Jr., President,
The Wire Association

IN THE EVENING

THE ANNUAL STAG SMOKER—DINNER

6:30 P.M.—Cocktail Bar Opens

7:30 P.M.—Dinner and Show

CHAIRMAN, ENTERTAINMENT COMMITTEE: Eber J. Hubbard, Jr.

COME ONE, COME ALL—AND HAVE A GOOD TIME!

THURSDAY, NOVEMBER 11th

The day is devoted entirely to plant inspection tours, of which there are two, as follows:

THESE TOURS WILL BE TAKEN JOINTLY BY BOTH THE FERROUS AND NON-FERROUS GROUPS.

In the morning busses will leave the Hotel at 9:00 A.M. for a tour of the plant of the Carboloy Dept., General Electric Company, Detroit.

At noontime, luncheon will be served with the compliments and through the courtesy of the Carboloy Department.

In the afternoon, busses will leave the Carboloy plant for a tour of the plant of the Ford Motor Company in Dearborn, Michigan.

FOR THESE TOURS, ALL PERSONS MUST GO BY BUS. NO PRIVATE CARS MAY BE USED. TO BE ADMITTED, ALL VISITORS MUST WEAR THEIR BADGES; NO EXCEPTIONS, PLEASE: THESE MEASURES ARE FOR SECURITY AND SAFETY.

These plant inspection trips conclude the 1954 Convention.

RESEARCH PAPERS ARE PREPRINTED IN THE OCTOBER ISSUE OF WIRE AND WIRE PRODUCTS.

The Discussions and the Mordica Memorial Lecture will be printed in the January issue of Wire and Wire Products.

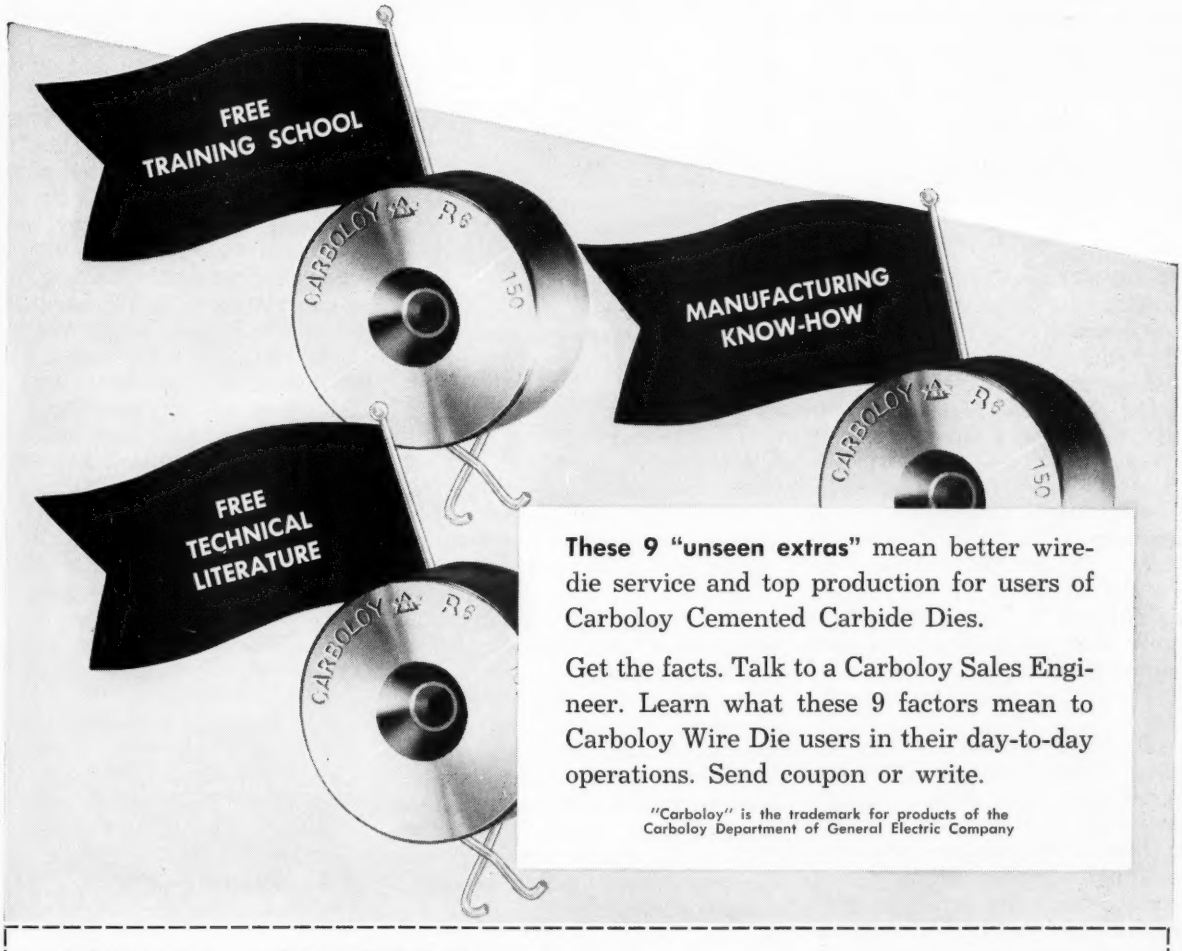
Papers not received in time for preprinting will be published in the November and December issues of Wire and Wire Products.

9 reasons why you get top

CARBOLOY

DEPARTMENT OF GENERAL ELECTRIC COMPANY

production when you specify Carboloy Cemented Carbide Wire Dies



These 9 "unseen extras" mean better wire-die service and top production for users of Carboloy Cemented Carbide Dies.

Get the facts. Talk to a Carboloy Sales Engineer. Learn what these 9 factors mean to Carboloy Wire Die users in their day-to-day operations. Send coupon or write.

"Carboloy" is the trademark for products of the Carboloy Department of General Electric Company

Carboloy Department of General Electric Company
11171 E. 8 Mile Road, Detroit 32, Michigan

I would like the following Carboloy services or literature:

- ☐ New Price List D-135
- ☐ Die Catalog D-130
- ☐ Complete information on Die Training School
- ☐ Call by a Carboloy Sales Engineer

Name_____ Position_____

Company_____

Address_____

City_____ Zone_____ State_____

Aspects and Advantages of Training In the Wire Industry

by H. Armitage Esq.,
Staff School Instructor
Frederick Smith and Company, Ltd.
Halifax, England

The author has spent his entire working life with Frederick Smith and Sons, Ltd. He was a wire drawer for twenty years. During that period he was elected a shop foreman of the Amalgamated Society of Wiredrawers and Kindred Workers, later becoming a member of its Executive Council. He was respected by both workers and employers alike. For the last seven years, he has been a Staff School instructor, concerned with labor selections, operative training, work study and welfare.
His lecture was delivered on June 2, 1954, at a Staff School session, part of the regular training program of Frederick Smith & Co., Ltd., and for it he was awarded a certificate of merit by the School.

We read frequently in the press that the employers and the trade union leaders are urging the need for greater productivity per worker so that our competitive powers may be increased and a trade depression, which could cripple the country's financial and social condition, be avoided.

★ ★ ★

Many slogans have been created, productivity councils formed, investigatory teams dispatched to other countries and posters issued to factories, all with the object of urging people to greater efforts in order to overcome our deficiencies.

★ ★ ★

Deliberation must lead us to the significant fact that if we produced more per person, the state of want would be proportionately reduced and the benefits resulting would then be available to each and every one of us.

★ ★ ★

All this is dependent upon our being able to produce the extra goods with the same available manpower, and if we all produced an extra 10% the problem could be solved—more easily said than done. Further, in order to meet the competitive prices of other nations our goods would have to be manufactured more cheaply than at present, and that can only be accomplished with the aid of greater industrial mechanization to enable us to produce more in less time; the factors of production-engineering and improved techniques are heavily involved. Eventually after considering all the various factors, we may find that the root of the whole problem lies in the inefficient utilization of the available manpower—there, surely, is bed rock and something on which we can commence building.

★ ★ ★

There are many approaches to the more effective use of manpower. Some employers may say they are achieving greatly improved output by well devised piece rates and bonus schemes; whilst one would probably agree that monetary incentives are a necessity, it should be realized that they are not the beginning and end of productivity planning; we must also consider other human fundamentals before truly effective results can be obtained—even from the most modern of labour-saving plants.

★ ★ ★

We should miss a vital point if we failed to understand that not all workers are in industry **solely** for the purpose of earning a living, although it must be admitted that the need for money is a principal driving force. But there are other incentives each having greater or lesser significance for the individual in accordance with the effect upon his own particular disposition and temperament. Interest in work is important—if a person is unsuited for his task or disinterested, how casual the work can be! The quality and quantity of the goods or services produced must, in some degree, be adversely affected. There is also the factor of personal pride and satisfaction in the job, which is to be found in men who by luck or careful selection have congenial work and strive for personal efficiency in the performance of it. The companionship which may be developed by building up a team spirit within a factory is another incentive. Ambition and opportunity to attain a better standard of living and a higher status in life are yet others. In all these matters sound principles of recruitment and training are a prerequisite of success in developing a truly efficient labour force.

★ ★ ★

The firm that, because of the effectiveness of its employee training methods, is able consistently to market a high quality product establishes a reputation for reliability which will greatly assist in maintaining a good order book. Even in times of trading adversity, such a firm will be among the last to go on short time and among the first to regain full employment. Circumstances such as these create a sense of security both for the firm and for the individuals employed there, and this is one of the greatest incentives any firm can offer to their employees. In those factories where the workers are engaged with little care and drafted to jobs for which they have no aptitude, or in which they are but poorly instructed, a feeling of frustration spreads through the

works and efficiency is progressively lowered. The firm which provides for careful selection and placing, for training and other instruction, and which is always on the lookout for talent among its workers will attract the best type of labour. It will also be almost certainly an effective works in terms of productivity per individual employed.

★ ★ ★

In order that labour selection may be effective it is necessary that the requirements of the job be examined and that the abilities and aptitudes of applicants be assessed, thus enabling the selection of the individual most suited to the work.

★ ★ ★

How important labour selection is to the success of training may easily be seen, particularly if one considers the cost of continuous replacement of labour in terms of money. Of course the type of job involved will influence the cost and if the job is such that new labour can undertake the work with a minimum of tuition, then the cost will not be as great as where training over a longer period is necessary; but think of it, too, in relation to the loss of output during the transition period and the extra wastage of material caused whilst proficiency is being acquired. The cost of replacement of labour has been assessed at £40 per man as a minimum, and this would of course rise in accordance with the degree of skill and training required. Whilst that figure may vary from firm to firm it is obvious that economically the stable labour force is very much a worthwhile objective; towards that end effective job analysis, labour selection and training play a very necessary part.

★ ★ ★

Anyone who has worked in the Wire Industry for many years will have seen considerable changes in methods of production, administrative practices and methods of training. Consider the methods of training practiced during the period extending over the past two decades; the more one thinks about that system, the more does one realize that it was far from being the acme of perfection. In the training of a craft apprentice there was laid down a period of time during which the apprentice was expected to reach efficiency. He was expected to learn his craft by working under the guidance of a craftsman, but seldom, if ever, was the ability of the craftsman to impart his knowledge taken into consideration. Many of us must know of instances where an operative is considered to be at the top of his class as a craftsman and yet is quite incapable of instructing a person in the application of his skill, probably because he cannot find words to convey his knowledge, has never been taught how to teach, or is unable to overcome such difficulties as slowing down his actions sufficiently whilst performing some intricate operation, in order that the trainee might see exactly what is being done. The craftsman can also desire jealously to guard his knowledge and be reluctant to reveal his special "wrinkles."

★ ★ ★

It is due to such factors that many an apprentice has failed to attain the standard which was expected of him. These failures were due not necessarily to the inefficiency of the apprentice, but rather to the inefficiency of the system which prevented constructive training. It is impossible to say how many apprentices left the Wire Industry during their apprenticeship period but it is probable that, of the total number, a large percentage left because of the frustration which was created by the lack of an organized method of training.

★ ★ ★

That, however, was in the past —the present day sees the apprenticeship system in the wire industry more or less at an end, due to the craft having been superseded by the introduction of modern production methods. The skills of the modern wiredrawer are less diverse than those of his predecessors, principally because the die polisher has taken over one of the most important functions of the craftsman—thus each occupation has become more specialized. This increased specialization of work demands that methods of operation be carefully determined and that the operatives be systematically trained in those methods. Although the craft operation has been split up, the amount of skill required to perform the various operations has in no way lessened. One may even be so bold as to say that the degree of skill required has become more pronounced because of the increased operational speeds of machines.

★ ★ ★

In other sections of the industry too, occupations demanding varying degrees of skill have become more exacting as a result of scientific advances in the various processes and the upward trend in plant speeds. These greater speeds which are a necessary factor in present day industrial competition call for increased accuracy of judgment by the operatives in order to prevent accidents to themselves or others and breakdown of machinery. Should an accident or a breakdown occur there is immediately an adverse effect on production. Here again it may be claimed that the answer lies in efficient training, for that is the surest way of decreasing such incidents to an absolute minimum.

★ ★ ★

Accepting the fact that changes have taken place and will always continue to do so, then consideration must be given to the current requirements which are essential as the basis for training in industry. The basic necessity is for training from two separate aspects: firstly, the in-works training to a progressive programme, and, secondly, external instruction designed to give a broader outline on matters relating to, and directly or indirectly concerned with, the occupation or industry.

★ ★ ★

Training within the works should be developed over several stages and it is vital that the first stage should begin on the right note. This is achieved most effectively by the Induction Course—its value in introducing new labour to the industry cannot be over em-

phasized and one of the good points amongst many is that it brings to the forefront the human approach of the employer towards the new entrant—a point which always registers favourably. The frequency with which it is necessary to put on the Induction Course will depend upon the labour turnover. The rate of labour turnover tends to be reduced by the use of an Induction Course and subsequent efficient training because, on the one hand, a better type of labour is attracted, and on the other, the workers—being made efficient through sound training—find more satisfaction in their work and are therefore less inclined to change their employment.

★ ★ ★

The content of a typical Induction Course may be illustrated by describing one which is being used in this industry. The first session consists of information on many subjects, all classified under the heading of welfare. These include the use of the time clock, practices and customs developed with the growth of the firm and finally agreed upon after collective bargaining, the accepted number of hours for the normal week, payment for overtime, recognized holidays, holiday payments, where and when payment of wages is made, relevant facts about the Canteen—the opening hours, kinds of meals available and their prices, the trolley service operating at certain times within the works, activities of the Sports & Social Club, the Workpeople's Sick Club, the Trade Unions and first aid facilities. All this prevents the new worker feeling that he is just another industrial commodity.

★ ★ ★

The second talk is one dealing with what happens to the wires after they leave the firm; a knowledge of the diverse and important uses of steel wire is found to infuse interest in what might otherwise seem a meaningless occupation. An exhibition of samples, supplied by customers illustrating what they make from our wire, is on permanent display in the lecture room.

There next follows a series of talks, the objective being to explain the principles of steel wire manufacture in non-technical language than can be understood by newcomers of average intelligence; the various processes and items of plant involved are illustrated by slides. The talks are carefully planned in such a way that the whole subject is broken down into logical sections, the content of each being no more than can be assimilated by a typical group. As a further precaution the longest talk is given first, when the group is most fresh; subsequent talks are of declining duration. At the conclusion of each section a short break is made and the opportunity used for inviting questions and encouraging discussion.

★ ★ ★

Not only do these talks serve to enlighten new employees in the methods involved in wire manufacturer—but each person also finds at what stage he plays his part and how important that part is to the final product; he is also made to realize the cost of producing such a commonplace thing as wire and thus appreciates the importance of avoiding unnecessary wastage.

★ ★ ★

The remainder of the first day is profitably spent in a tour of the works. The group see in actual operation the plant about which one has been talking and, whilst making the tour, are encouraged to ask further questions. Let us consider two important results arising out of making such a tour —first, the new employees have the advantage of seeing the location of each department, and this enables them to settle in much more quickly; second, the natural curiosity of the new entrants as to what happens in adjoining departments is satisfied.

★ ★ ★

Concluding the tour of the factory, reassembly is at the lecture room and opportunity again is given for questions, prompting a little if questions do not appear to be forthcoming; creating discussion by summarizing the day's activities is also found useful—in this way it is often possible to re mind a group member of some point temporarily forgotten.

★ ★ ★

The following morning the Induction Course continues, this time on a different theme; the scene changes from the actual manufacture of wire to departmental organization and the functions of management. In order to develop this subject on the right lines, an opening lecture devoted to the growth of an imaginary business from its inception as one man's part-time occupation is found to be most effective. In this way it is possible to bring to light the many functions performed in the first place by the one man, and later to trace the establishment of separate specialist functions in departments within the growing concern until ultimately the present standard of management practice is reached.

★ ★ ★

From that starting point, with the aid of organization charts, the management structure of the firm is explained. The scope of the subsequent talks includes the formulation of the firm's policy by the Board of Directors and the Managing Director's responsibility for the interpretation and implementation of that policy; the delegation of responsibility to Divisional Managers, Departmental Managers and Foremen; the functions of each Section, Department and Division and the co-ordination of their efforts towards the objectives of the firm as a whole. That is what the fellow on the shop floor is wanting to hear. He has little knowledge of what takes place in the control and operation of these departments and he is eager to listen and to learn. He gets to know facts about each department which often have the effect of considerably modifying his views on management.

★ ★ ★

When giving these Induction Course lectures one is forcibly reminded that each of us should realize that he has a part to play in the production of the final article—that ours is a small part and that we are dependent on others

to play their part just as much as they are dependent on us. To operate as a team, to play their part with others, to play fair with themselves—is what one must try to instill into people who attend the course.

★ ★ ★

Whilst an Induction Course is primarily for the new entrants, consideration must also be given to employees already in the service of the firm. Those employees may have been in the service of the firm for many years, by virtue of their long service and experience, will undoubtedly be capable of doing their jobs satisfactorily. They tend, however, to do the job mechanically to the set pattern, believing that it is being done right and yet often not knowing what they have done or why they have done it; the reason being that their interest has not been aroused to find out more about their own job, and it seems that in the past no one considered it necessary to tell them. So they carry on in the same old manner, perhaps with no interest and no ambition.

★ ★ ★

These people must be given the same chance as the new entrants of learning more about their job and the industry in which they have worked for so long and which must now be part of their lives. By including present employees in induction courses it is possible to avoid the friction and dissatisfaction which can be caused by new entrants being better informed than established personnel.

★ ★ ★

Having concluded an essential part of training by the Induction Course we must then move on to the second stage—that of making the operative efficient. He now has a good knowledge of the fundamentals of the industry, the intricacies of the various operations of which he has yet to learn.

★ ★ ★

Under normal circumstances someone is delegated to show the new entrant how to do his job; too often he is placed with the first person seen on entry to the department or possibly with the workman who will be his immediate neighbor. Unfortunately, it is more than likely that no consideration will have been given to whether that person can teach the operative the right methods or whether the best methods have been devised. It is on such points that the training schemes are dependent for success or failure. Let us consider these factors separately, paying attention first to that of teaching and the ways in which a firm can organize its training methods to remedy any inefficiencies they may have in that respect.

★ ★ ★

In the training of an operative on a particular job the concentrated and undivided attention of the teacher is required in order to impart the necessary knowledge in the shortest possible time, taking into consideration the degree of response from the pupil to that instruction. With that in mind, it is unwise to expect a person to teach a number of persons simultaneously. It is far more practicable to teach one individual at the speed of retention by that person. That is the controlling factor of the rate of progress in instruction, and individuals vary considerably in their retentive powers.

★ ★ ★

The ideal place to impart instruction is in a department separate from the rest of the factory, wherein new entrants and newly promoted labour may be trained. Transfer to the new occupation should then be effected only when proficiency has been developed to the standard required by the firm for the department in which the operative is to work. Despite these measures a follow-up is desirable in order to ensure that the operative progresses satisfactorily and adheres to the instruction given. This latter step is necessary because there is often some established operative who, wishing to show his knowledge to the newcomer and probably being immune to change, makes the claim that his own method is the better and is in fact the way it has always been done in the past. In that there is a very real problem which needs careful watching to prevent organized training losing effectiveness on the processes for which it has been developed.

★ ★ ★

Unfortunately few firms are in the happy position of being able to spare a separate Training Centre equipped with all the necessary machinery and equipment for their training schemes. In most cases it is necessary to develop other ways of training in which the instruction is given on the shop floor. Under these conditions it is not easy to maintain the necessary continual attention to instruction unless one can grow to disregard the distracting stares and often untimely offers of assistance from other operatives in the department. Most firms have many departments and the training of different operatives may frequently be required simultaneously in two or more departments, in which case, individual training cannot be given by one instructor. The most practicable solution to adopt for such circumstances is for one person in each department to be trained as an instructor and to give the necessary instruction under the general guidance of the Training Officer.

★ ★ ★

Firms who consider that they are not large enough to employ a Training Officer should not abandon training schemes as being outside their capabilities; provided someone is sufficiently interested to make the necessary arrangements, it is possible to have persons trained to give instruction in each department.

★ ★ ★

Once more reference must be made to the persons already employed who may require instruction on improved methods of working. In some cases it is very difficult to deal successfully with these people and whilst it is the wish of everyone to assist them, consideration has to be given to the question of whether they will react favourably to new methods. Where it is considered that training will improve their efficiency, then let training be given; but where elderly persons have reached the stage of being unable

(*Please turn to page* 1029)

Status of Polymonochlorotrifluoroethylene Insulated Wire

by L. A. Walters
Director of Research
The Rex Corporation
West Acton, Mass.

This paper was delivered at the Signal Corps Symposium on Wire and Cable at Asbury Park, N. J., on December 15, 1953. It is published here by the courtesy and with the permission of the author.

Military Requirements

Field equipment used by our Armed Forces is frequently subjected to extremely severe conditions of temperature, heat, humidity and impact on handling. Failure of equipment in service can lead to serious consequences. Therefore, every effort is made by the services of supply to take all of these factors into consideration when the design is contemplated. It is natural that these services select the best materials readily available from industry. When failure of existing and established materials does occur, this requires investigation into the new materials and those that have potential value for the application under consideration.

★ ★ ★

When conventional hook-up wires coated with the vinyl resins, failed to withstand the temperatures which were developed in vibrator power supply units, the components and materials branch of the Squier Signal Laboratory, under the direction of Messrs. M. Tenzer and J. Spergel, initiated a program to evaluate polymonochlorotrifluoroethylene for this purpose. The reason for failure of the vinyl was due to short circuits caused by condensation of volatiles on the back of the connector, which was located in the coldest part of the equipment. The volatiles were plasticizers given off by the vinyl material. Furthermore, hot spot temperatures of 115°C to 120°C, located in the vibrators and power resistors, also damaged the vinyl insulation upon contact and ruled out the possibility of using polyethylene and other available insulating materials. Commercially rated 105°C vinyl wire could not be used because it did not possess the flexibility required at low temperatures and exhibited some weight loss due to volatilization of plasticizer, which resulted in further embrittlement of the insulation. The development of an insulated wire using polymonochlorotrifluoroethylene was stepped up months, possibly even years, by the active interest and encouragement of the Signal Corps Engineering Laboratories.

Properties of Polymonochlortrifluoroethylene

For purposes of brevity, and since most of our work has been done with Kel-F, a trademark for polymeric monochlorotrifluoroethylene produced by The M. W. Kellogg Company, we will herein refer to this material as such. The resin discussed here is unplasticized, high molecular weight material, in a range of 75,000 to 110,000. The Bakelite Company also manufactures polymonochlorotrifluoroethylene under the trade name of Fluorthene. The quality of their product seems to us, on the basis of limited experience with it, to be equivalent to Kellogg's.

★ ★ ★

From either source, the polymer is a high temperature, chemically inert, water resistant, non-flammable thermoplastic, which exhibits outstanding electrical properties. It is characterized by the formula $(CF_2\ CF\ Cl)_x$ and has a transition point in the neighborhood of 211°C (410°F). It may be placed in the class of the more rigid polymers. However, in thinner sections, such as in wire insulation, it possesses satisfactory flexibility over a wide temperature range.

★ ★ ★

Kel-F may be used between temperatures of —339°F to +392°F. However, the use over this temperature range is dependent upon the molecular weight, thickness of the section, and the nature of the stresses being applied. It does maintain adequate flexibility over a wide temperature range, in contrast with elastomeric type materials which become extremely rigid and brittle at lower temperatures and rapidly become soft and rubbery at higher temperatures.

★ ★ ★

The known chemical inertness of this material was demonstrated when it showed no visible effect from the solvent resistance tests performed by the Signal Corps Laboratory. Furthermore, there was no change in dielectric strength after exposure to such solvents as alcohol, gasoline, toluene, carbon tetrachloride, acetone, etc.

★ ★ ★

Water is ever present and often the cause of many electrical failures, either by forming a continuous path between electrodes or by absorption into the plastic mass. In the case of Kel-F, it is not wet by water and has no measurable moisture-vapor transmission in film thicknesses of 3 mils or higher, thus permitting direct immersion

if necessary, in water or corrosive aqueous solutions. Also, it is a nonflammable material. This property becomes more and more desirable as surface temperatures become higher and higher.

★ ★ ★

Excellent electrical properties are shown by the high volume resistivity in the order of 1×10^{18} ohms-cm at 25°C, and 3×10^{14} ohms-cm at approximately 210°C, also a high dielectric strength, approximately 2500 volts per mil tested by the short time method and which is retained over a wide temperature range. Its low dielectric constant 2.4 to 2.8 is in the same class with some of the best materials for this property.

★ ★ ★

The unique combination of properties makes this resin outstanding as an insulating material. While it is true that polyethylene does have a lower dielectric constant, it does not possess the high temperature resistance of Kel-F. Polytetrafluoroethylene, which has excellent electrical properties, will be limited by the molding techniques required and by the difficulty in color coding. The property of slight cold flow and only moderate abrasion resistance, present other possible objections. Further, there is some indication of microporosity in presently available Teflon coated wire.

Extrusion Problems

Initial extrusion work on Kel-F was done by the industry generally with conventional vinyl equipment and dies. However, excessive material breakdown resulted and modifications became necessary. In an effort to localize the high temperature zone, the die bushing was extended beyond the body of the die, approximately 1″ to 2″. The guider tip was also extended an equivalent length. The land was increased from the normal vinyl land length of ¼″ to ½″ to approximately 1-½″ to 2″. An important design consideration was to reduce the inventory of stock within the die to a minimum. Although these modifications did help in reducing material breakdown, it was still of a serious nature and production rates were low.

★ ★ ★

The next step was to try the nylon technique for wire coating. Here again, material breakdown was also serious, but it was due primarily to overheating of the material in the neighborhood of the self-centering serrations of the nylon guider tip. The serrations were eliminated, but the tube-on technique of the nylon method was retained. In an effort to raise the production rate, the I.D. of the die bushing and the guider pin was increased, giving a plastic layer at the die between .050″ and .100″. The guider tip diameter was also increased to permit the installation of a heating element. These modifications helped to raise the molecular weight.

★ ★ ★

As the I.D. of the die bushing and guider tip increased, so did the cone of material emerging from the die. When the cone was drawn from the die in a horizontal manner, there was a tendency for the wire to hit the top of the sagging cone, causing a pull and non-uniform coating on the wire. To overcome this condition, vertical extrusion was used. This method eliminated the gravitational effects and improved the general quality of the wire. Further refinements brought the process to a commercial stage.

★ ★ ★

Thermal degradation is one of the most serious factors to consider in Kel-F wire coating. If the material is degraded excessively, the coating will have a tendency to be crystalline and brittle and to crack on room aging from the stresses set up by orientation. The lower the molecular weight of the resultant coating, the more readily is there a tendency for crystallinity to develop, particularly on heat aging. Initial efforts by the wire industry generally resulted in low molecular weight coatings. However, as our familiarity with the material grew, we were able to apply our own know-how to the many practical problems which had to be solved before we could achieve the extremely desirable properties of the material. In solving extrusion problems, we were aided substantially by The M. W. Kellogg and the Bakelite Companies. The latter has been especially helpful to the industry in being the first to point out the desirability of orienting the extrusion, and thus to minimize crystallinity. As a result of cooperative effort, and with increased experience, it is now possible to insulate wire with polymer that begins to approach the maximum performance which is theoretically possible.

Color Coding

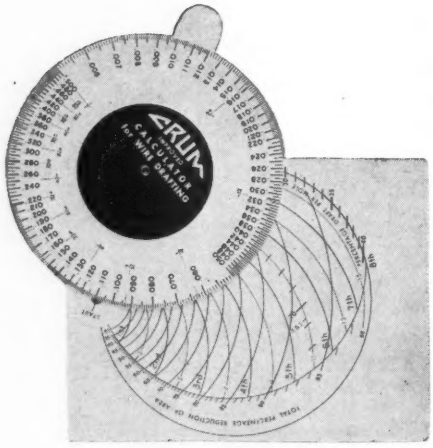
The natural clarity of Kel-F lends itself well to the addition of pigments for identification and color coding. However, since the material manufacturers are not in a position to supply a variety of colors for this application, it has become necessary for the wire industry to do its own pigmenting. In some cases, the insulators have found that they could purchase the powder form or low density form of Kel-F and color this material by using low temperature extrusion techniques with simultaneous pelletizing. As various pigments were added to the Kel-F resin, it was found that some of these pigments were responsible for excessive material breakdown or would have a tendency to act as a stabilizer or stiffening agent. The pigment effect was noted not only in viscosity measurements but also in the extrusion characteristics. The materials that caused degradation could be passed through the machine at a lower load and the extruder could be operated at lower temperatures, whereas those that did not degrade the base resin could be operated at temperatures normal for unpigmented polymer. The red pigments were particularly bad insofar as degradation was concerned. Cadmium pigments, which contained a fair amount of free Selenium, were found to be responsible for considerable degradation. Therefore, a relatively long investigation by trial and error has been necessary to find a selection of pigment which will produce the entire range of NEMA and/or JAN colors.

(*Please turn to page* 1027)

THE NEW and IMPROVED . . .

CRUM CALCULATOR

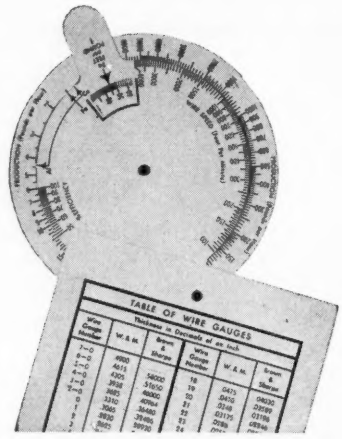
FOR WIRE DRAFTING



Front view of Crum Calculator.

THIS NEW DOUBLE-PURPOSE CALCULATOR WILL:

1. Provide quicker and more accurate information on die sizes and reduction areas;
2. Calculate wire production rates for various speeds and efficiencies.



Reverse view of Crum Calculator.

SOME OTHER FEATURES OF THE CALCULATOR

- Has new scale for more accurate determination of small percentages.
- Gives readings in B & S gauges.
- Intermediate lines provide reductions for 16 holes in one setting.
- New rectangular shaped back for better protection of calculator.
- More legible % draft-per-hole scale.
- Vinyl plastic construction, resistant to wear, warping, dirt, perspiration, wire drawing soaps—can be cleaned.
- Still fits your vest pocket.
- Handy tables of W & M and B & S gauges.
- Feet per pound calculating scale for steel, copper and aluminum wires.
- Durable, accurate, easy to use.

The improved Crum Calculator is worth its weight in gold in time saving —no laborious mathematical calculations necessary when you use it. Instruction sheet with examples accompany each Calculator. You should have one or more in your wire drawing department.

THE PRICE: $5.00 EACH

Send your orders to:

WIRE AND WIRE PRODUCTS

453 MAIN STREET **STAMFORD, CONN.**

(Exclusive distributors)

Government Wire Production Information

Government Purchases Announced

Quantities bought through June 30, 1954 under the Government's purchase programs for domestic tungsten, manganese, chrome, mica, beryl, asbestos and columbium-tantalum were announced in July by **Edmund F. Mansure,** Administrator of General Services.

★ ★ ★

The programs were established to stimulate the search for and production of strategic and critical materials in the United States. They are separate from the exploration program of the Defense Minerals Exploration Administration, Department of the Interior.

★ ★ ★

Tungsten. The figures included in today's report are based upon operating information GSA has received from its field units. They are subject to revision when a final audit of them is completed sometime in August.

★ ★ ★

Tungsten concentrates under the Government purchase program are accepted at various milling points, mostly in the West.

★ ★ ★

The regulation setting up the tungsten purchase program was published in the Federal Register on May 11, 1951. Purchase of 3,000,000 short ton units (20 pounds each) of contained tungsten has been authorized. Delivered to date: 985,295 short ton units.

★ ★ ★

Manganese. Manganese is accepted at four depots—Butte and Philipsburg, Montana; Deming, New Mexico, and Wenden, Arizona. Manganese is also accepted in carload lots at any rail point in the country.

★ ★ ★

Regulations establishing the Butte, Philipsburg and Deming depots were published July 21, 1951; the Wenden regulation was published July 3, 1952, and the carload regulation on July 9, 1952.

★ ★ ★

The quantities authorized are: 6,000,000 long ton units (22.4 pounds each) of contained manganese for Butte and Philipsburg together; 6,000,000 long ton units for Deming; 6,000,000 long ton units for Wenden, and 19,000,000 long ton units for the carload program. Delivered to date: Butte and Philipsburg, 832,500 units; Deming, 1,368,000 units; Wenden, 4,210,600 units; carload program, 1,350,900 units.

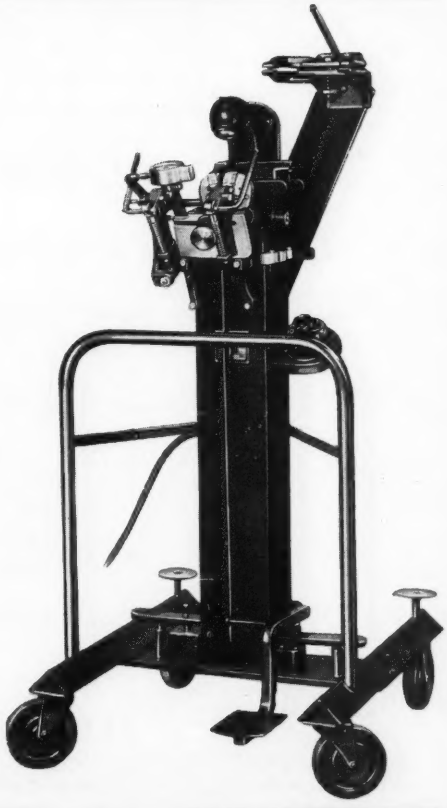
★ ★ ★

MICROMETER PRECISION — MICRO-WELD — TRADE MARK REGISTERED

MODELS J-3-S and J-4-S AUTOMATIC MICRO-WELD BUTT WELDERS

These welders are used for welding high and low carbon STEEL, and STEEL ALLOY wire, ranging in size from .020" to .160" diameter. All operations on these units, which include the clamping of the wire being welded, contacting the welding switch, and upsetting the weld, are made by a single downward stroke of the foot pedal. Welders for high carbon steel wire are equipped with the exclusive MICRO-WELD Dial indicating annealing device to facilitate the annealing operation of high carbon wire.

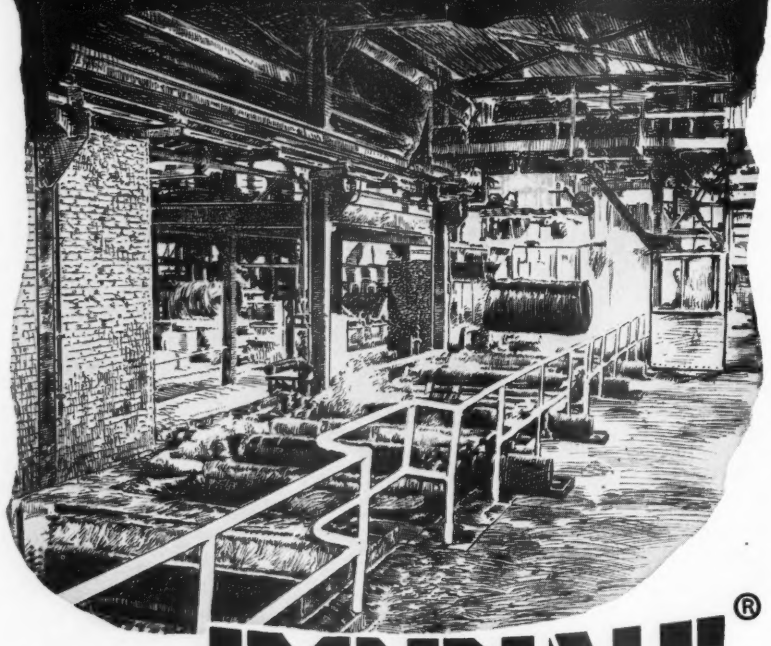
Standard equipment with these units include annealing dies, filing vise, light extension cord, and mounting on a 4-wheel truck. Special units can be furnished for crane mounting.



MICRO PRODUCTS CO.

20 NO. WACKER DR., CHICAGO 6, ILL.
Telephone: STATE 2-7468

EFFICIENT PICKLING



with RODINE®

Illustrated, is a section of the pickling plant of one of the largest steel companies in the U.S.A. Most leaders in the industry use "RODINE" because:—

"RODINE" assures cleaner, better pickled surfaces—

SAVES good metal by inhibiting acid attack—

PROLONGS the life of the sulfuric or muriatic acid pickling bath—

HOLDS noxious fumes to a minimum—

It is cheaper to pickle with "RODINE" than without "RODINE".

Pioneering Research and Development Since 1914

AMERICAN CHEMICAL PAINT COMPANY

CHEMICALS ACP PROCESSES

AMBLER, PA.

DETROIT, MICH. NILES, CALIF. WINDSOR, ONT.

Chrome. Chrome ores and concentrates are accepted at a depot at Grants Pass, Oregon.

★ ★ ★

The program was published August 28, 1951. Purchase of 200,000 long tons of ores and concentrates has been authorized. Delivered to date: 64,282 long tons.

★ ★ ★

Mica. Mica is accepted at three depots—Spruce Pine, North Carolina; Custer, South Dakota, and Franklin, New Hampshire. It is accepted in three forms—block, film and hand-cobbed. Under a revision of the program announced July 23 the depots now will accept nonruby mica, subject to electrical tests, as well as ruby mica.

★ ★ ★

The program was published March 15, 1952. Purchase of 25,000 short tons of hand-cobbed mica or the equivalent has been authorized. (For purposes of the program, 90 pounds of block or film mica are considered as the equivalent of one ton of hand-cobbed mica.) Delivered to date: 3,413 tons of all types at all depots.

★ ★ ★

Asbestos. Nonferrous crysotile asbestos in three grades, Crude Nos. 1, 2 and 3, is accepted at a depot at Globe, Arizona. The program was published December 23, 1952.

★ ★ ★

Purchase of 1,500 short tons of Crude No. 1 and/or No. 2 has been authorized. Crude No. 3, which is accepted on a tie-in basis with the other two grades, is not figured into the quantity authorized. Delivered to date: Crude No. 1 and No. 2; 451 short tons; Crude No. 3, 249 short tons. Total, in terms of program, 295 tons Crude Nos. 1 and 2.

★ ★ ★

Columbium-Tantalum. Columbium-tantalum ores and concentrates are accepted in small lots at three depots—Custer, South Dakota; Franklin, New Hampshire, and Spruce Pine, North Carolina. The regulation covering such purchases was published October 30,

1952. No specific limits have been set for the depots.

★ ★ ★

Columbium in lots of 2,000 pounds and over and tantalum in 1,000 lb. lots and over is purchased from both domestic and foreign sources through four agents—Fansteel Metallurgical Corporation, North Chicago, Ill.; Wah Chang Corporation, New York, New York; Kennametal, Inc., Latrobe, Pennsylvania, and Emergency Procurement Service, GSA, Washington, D. C. Delivered to date (Foreign and Domestic combined): 4,666,271 pounds.

Purchase of 15,000,000 pounds of contained combined columbium-tantalum pentoxide has been authorized.

New Organization Manual

Publication of the 1954-55 edition of the "United States Government Organization Manual" — a Government best seller—was announced today by the **General Services Administration.**

★ ★ ★

The revised Manual reflects the organization of the Federal Government as of July 1, 1954, and includes the names and titles of approximately 3,500 key officials.

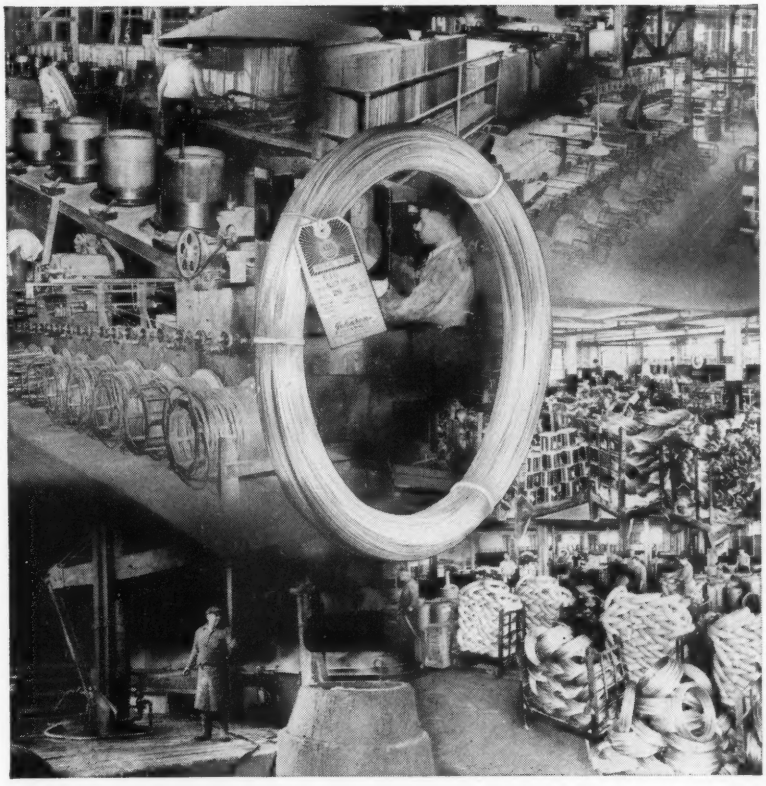
★ ★ ★

A section outlining brief histories of all Federal agencies whose functions have been abolished or transferred since March 4, 1933, appears as Appendix A.

★ ★ ★

In the revised Manual may be found the answers to many questions that arise daily in Washington and throughout the Nation — questions such as, What are the names of the members of the President's Cabinet, the Secretary of the Navy, the Army, the Air Force? What happened to the Production and Marketing Administration? The Reconstruction Finance Corporation? What are the functions of the United States Information Agency? Is the National Production Authority still in existence?

★ ★ ★



Maturity means meeting problems without yielding to them, but not blowing your top when they fail to yield.

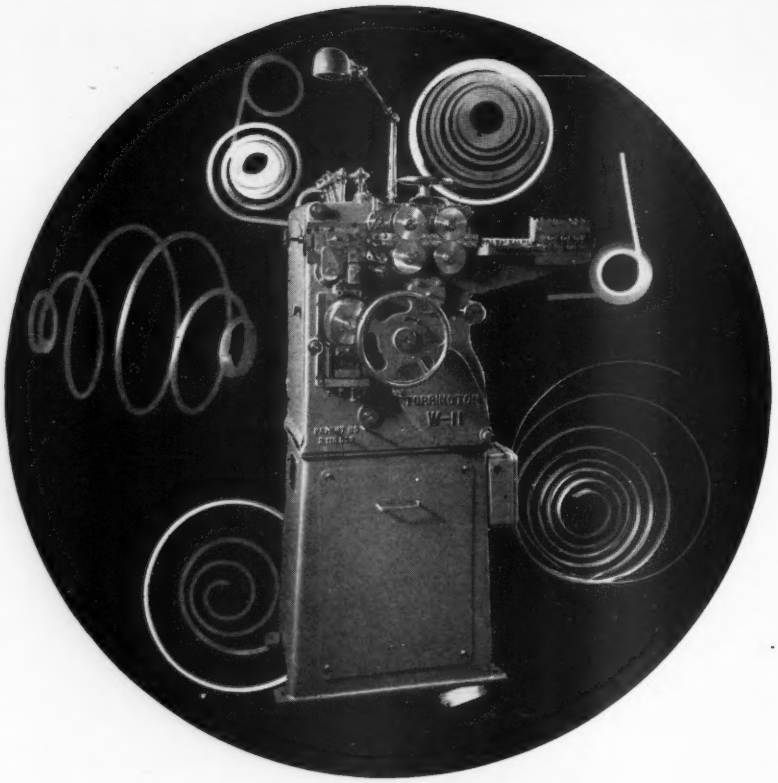
And, there are problems in the specialty wire business, problems that have been met through the years. But in meeting them—not yielding to them—we here at JOHNSON have learned to make high carbon wire better to such an extent that we can say candidly that there is no better music wire than XL0 anywhere.

JOHNSON STEEL AND WIRE COMPANY, INC.

WORCESTER 1, MASS.

New York Philadelphia Pittsburgh Cleveland Detroit Akron
Dayton Chicago Atlanta Houston Tulsa Los Angeles

A SUBSIDIARY OF PITTSBURGH STEEL COMPANY



VERSATILE

TORRINGTON

SPRING

COILER

In spring coiling, the words "Torrington" and "Versatile" are synonymous! When you desire springs produced to meet exacting requirements, just call the professional springmaker who has a Torrington coiler. He's the man who can fill your needs with accuracy, speed and economy. On special springs, our sales department will gladly assist you in finding a source of supply, or help your springmaker devise just the right tooling to produce it.

SPECIFICATIONS
of the Model W-II Spring Coiler

The 14 different Torrington Spring Coilers cover a range of wire diameters from .003" to .750".

Wire diameter range: .015" to .072"

Wire Length per Spring: 0" to 42" (Extra wire Feed Gears Available)

Coil Range (O.D.): 3/32" to 1-9/16"

Production: 23 to 190 springs per minute with variable speed drive.

Torsion and other attachments are available.

THE
TORRINGTON
MANUFACTURING COMPANY
TORRINGTON, CONNECTICUT

As the official organization handbook of the Federal Government, the 742-page Manual contains sections on the legislative, judicial, and executive branches. The descriptive material outlines the legislative authority, purpose, functions, and activities of each agency, and includes 39 charts showing the organization of Congress, the executive departments, and the large independent agencies as of July 1.

★ ★ ★

The Manual is one of the 5 best sellers published by the Government. Compiled by the Federal Register Division of the National Archives and Records Service, General Services Administration, the Manual may be purchased for $1.00 a copy from the Superintendent of Documents, Government Printing Office, Washington 25, D. C.

New One-Piece Nut and Lock Washer, Hardened Steel Throughout

Harvey Jacobson, president of the **Jacobson Mfg. Co., Inc.,** Kenilworth, New Jersey, has announced that his company is now manufacturing a new line of Self-Locking Nuts, consisting of a One-Piece Nut and Lock Washer combination, designed to sell at a fraction of the cost of other pre-assembled nuts and lock washers.

★ ★ ★

Serrated, hardened teeth on the face of the nut provide positive locking action. In addition, their all metal construction makes these new Self-Locking Nuts immune to the effects of oil or water.

★ ★ ★

Jacobson Free-Running, Self-Locking Nuts are hardened by scientifically controlled heat treating and are available in All Machine Screw Sizes.

★ ★ ★

For further information, engineering assistance and samples, inquiries should be addressed to Jacobson Mfg. Co., Inc., Kenilworth, New Jersey.

ABSTRACTS

WIRE DRAWING

ALUMINUM WIRE AND CABLE FACTORY.
Aluminum Wire & Cable Co Ltd, Port Tennant, Swansea. Engineer 1954 Vol 197 (5125) pp 564-565 (Apr 16); Engineering 1954 Vol 177 (4604) pp 538-539 (Apr 23); Wire Ind 1954 Vol 21 (245) pp 500-502 (May).

Description of plant. Eleven-die continuous wire-drawing machine illustr. Diamond dies used in fine wire machines, ie for wire from 20 to 39 SWG (0.0052 in. dia). Dies maintained to close limits by special maintenance shop, equipped with machines supplied by Rudkin & Riley Ltd, and with BISRA profiloscope. 5 illustr.

LUBRICANTS FOR METAL-WORKING OPERATIONS IN THE NON-FERROUS METALS INDUSTRY.
Anon. Inst Met Journ/Bull 1954 Vol 2 (8) pp 100-104 (Apr).

Summary of informal discussion under auspices of Metall Engg Comm, Birmingham Univ, Jan 6, 1954. Under 'Lubricants for the cold drawing of non-ferrous metals and alloys', pointed out that future developments depend on results of research recently initiated into conditions at metal/die interface. Evidence that effectiveness of mineral oils falls off at higher speeds; refrigeration of wire-drawing dies possible.

EINFUEHRUNG DER NORMZAHLEN IN DIE SIEBTECHNIK. INTRODUCTION OF PREFERRED NUMBERS IN SIEVING TECHNIQUES.
J. Ivers, W. Dannien. Din-Mitt 1954 Vol 33 (5) pp 228-229 (May 1) (In German).

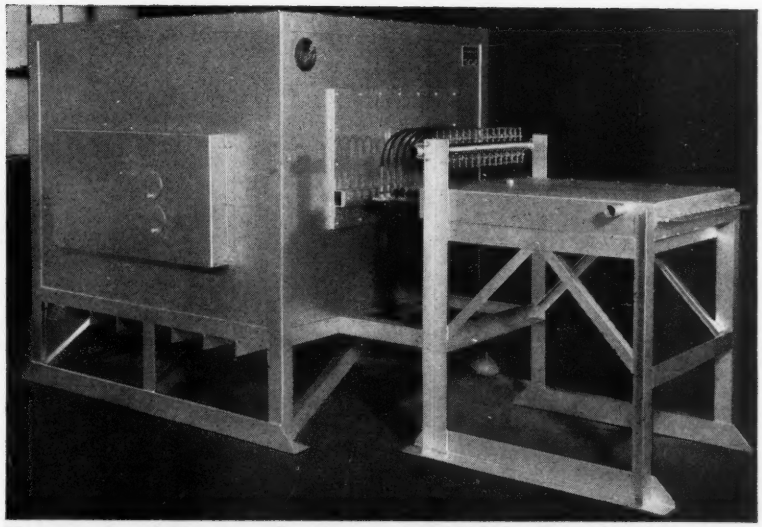
In recent German standards DIN 4186 on weaving wires and DIN 4189 (Sheet 1 and 2) on wire meshes, preferred numbers introduced. General information on data in these standards.

DIE ENTWICKLUNG, HERSTELLUNG UND NACHARBEIT VON ZIEHSTEINEN. THE DEVELOPMENT, PRODUCTION AND REMACHINING OF DRAWING DIES.
V. Wegener. Draht-Welt 1954 Vol 40 (7/8) pp 79-81 (Apr 25); (9) pp 97-98 (May 10) (In German).

General recommendations.

AUS DER TAETIGKEIT DES VEREINS DEUTSCHER EISENHUETTENLEUTE IM JAHRE 1953. ACTIVITIES OF THE VEREIN DEUTSCHER EISENHUETTENLEUTE IN 1953.
Anon. Stahl & Eisen 1954 Vol 74 (11) pp 689-719 (May 20) (In German).

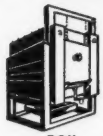
Comm on wire working conducted investigations into shapes and wear of drawing die profiles. Testing instruments for drawing dies, developed during 1950/51, used in several works for large scale tests to find most suitable drawing die shape and bearing length. Owing to number of tests and extent of work involved, no report could be published during this year. Sub-comm on wear testing issued German standard on evaluation of wear tests (DIN 50 323). Sub-comm on machinability produced several reports on turning and



Harper 30 Strand Wire Annealing Furnace . . . Models for Research and Continuous Production

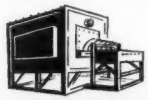
Bright Annealing by the Mile

Saving Time, Cutting Costs for Mills and Fabricators


BOX

BELL

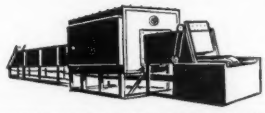
ELEVATOR

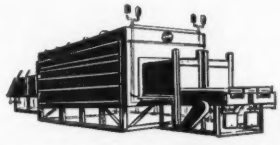

STRAND ANNEALING

Growing uses of stainless steel and non-ferrous wire and strip has created new annealing and cleaning problems for operators and their customers.

The specialized design of Harper bright annealing furnaces is making it possible for wire mills to produce uniform products ready for spooling and fabrication. Expensive cleaning operations are eliminated . . . manhour costs are cut . . . floor space is saved.

Write for full information on automatic, continuous production Harper bright annealing furnaces for Wire and Strip.


CONTINUOUS MESH BELT CONVEYOR


TWIN AND SINGLE MUFFLE PUSHER

Furnace Builders Harper *for over 30 Years*

Representatives in Principal Cities

HARPER
Electric Furnace Corp.
42 RIVER ST., BUFFALO 2, N. Y.

Forming the above Special Pan Head Bolt in two blows presented a difficult cold heading problem that was solved by the use of Keystone "Special Processed" Cold Heading Wire.

The superior grain flow characteristics of "Special Processed" Wire provided the necessary upsetting and die forming qualities to withstand the terrific displacement of metal during the two blow process. The head was formed without buckling, distortion or cracking — longer die life, increased production, and a higher quality finished product resulted.

Carefully selected ingredients — our own exclusive drawing and heat treating process — rigid quality controls and inspections — give this wire unsurpassed performance on any unusually difficult cold heading job. Your inquiry is welcomed.

boring tests on steel. Comm on powder metallurgy issued number of test sheets. 205 ref.

USE OF CERAMIC SLEEVES OR BUSHES IN THE PRODUCTION OF STEEL CABLES.
V. A. Kacher, V. A. Chelombit'ko. Vestnik Mash 1953 Vol 33 (11) pp 91-92 (Nov) (In Russian).

In Russian production of strands for steel cable, so-called basket or cigar type spinning machines are often used, with 6 to 36 spools. Method briefly described including use of sleeves or guides made of carbon steel U8. These, used at plate speeds up to 1,200 rpm, are subject to heavy wear; and after 5 or 6 working shifts they fail owing to being cut through by wire. Search for more resistant material therefore urgent since monthly consumption of sleeves for one high-speed machine was 250 to 300. Metal Technology Dept of Kharkov Polytechnic undertook experimental work with several materials, ceramic or otherwise, including hardmetals. Eventually ceramic known under mark TsM-332 [microlite, or pure dense fine-grained corundum] proved to be best. After 6 months use on high speed machine, little or no cutting by wire had occurred. Friction between guides and wire much less. This material now used in many cable-making factories; also in making hemp and twine ropes etc, where speeds are up to 1,850 rpm for parts involved. 6 illustr.

NOTICE

These abstracts are furnished through the courtesy of the Industrial Diamond Information Bureau, 32 Holborn Viaduct, London, ECI, Eng. Requests for further information should be directed to the Bureau.

To Exhibit Automatic Carbon Controller Metal Show

The new **Surface Combustion** Autocarb Automatic Continuous Carbon Controller will be featured at the 1954 Metal Show to be held in Chicago, November 1-5, 1954. This instrument, used in conjunction with the 'Surface' Dew Point Recorder, provides for continuous control of the carbon potential of the furnace atmospheres. It is used for control of furnace atmosphere in gas carburizing, clean hardening, and other heat treating processes.

★ ★ ★

Surface Combustion's exhibit will also present special and standard Heat Treat equipment for all heat treating processes, including Steel Mill operations. Surface industrial gas burner equipment and Janitrol unit heaters for industrial plant heating will also be included in the display.

65 New Standards Approved at 1954 ASTM Annual Meeting

Featured by 36 technical sessions at which were presented 110 technical papers covering various aspects of engineering materials, the 1954 Annual Meeting of the **American Society for Testing Materials,** held throughout the week of June 13 at Chicago, included 600 meetings of the technical committees.

★ ★ ★

Seventy-two of the Society's technical committees reported at the meeting, with the result that 65 new specifications and tests were approved and revisions in 229 existing tentatives and standards were acted on. A total of 109 specifications and tests that have been published previously as tentative were approved for reference to Society letter ballot for adoption as standard. All of these new and revised standards will be published later in the year in the 1954 Supplement to the Book of ASTM Standards.

★ ★ ★

Including the 1954 Annual Meeting actions there are now about 2120 ASTM Standards. This compares with the figure twenty years ago of 730 and ten years ago, 1944, of about 1280. These figures indicate a definitely increased tempo in standardization activities during the last decade.

Japanese Book on Wire Rope

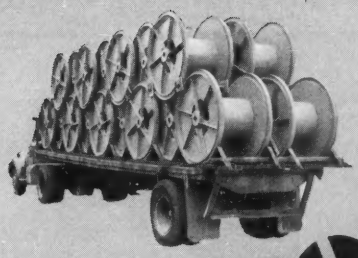
T. Nishioka, Director of **Teikoku Sangyo Co., Ltd.,** 67 Tsude, Kaizuka City, Osaka Pref, Japan, has published a technical book called "Manufacture of Steel Wire Ropes," written, of course, in Japanese.

★ ★ ★

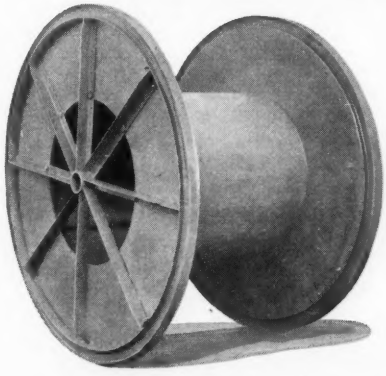
An interesting counterpart to this book is an English supplement giving the translation to the chapter headings and sub-heads, followed by a digest of the principal information, including mathematical formulae, etc. This English edition is entirely hand lettered and written and has been reproduced as blueprints of the various pages, and then bound.

There's no premium on INGENUITY at NYECO

Here are 32 Steel Shipping Reels being delivered on 1 especially rigged truck. One more example of the versatility and flexibility that go into every NYECO job . . . that make for happy customer relationships.



NYECO Steel Shipping Reels



YOUR BEST BUY!

because they cost so little more, last *12 times* longer than wooden reels, require minimum maintenance. Rugged weatherproof, splinter-proof, warp-proof construction protects costly cable against damage due to dropping, bouncing, rough handling. It doesn't pay to risk an investment of thousands on inferior reels.

ANY QUANTITY · ANY SIZE · ANY LOAD · FLANGE DIAMETER FROM 36" UP

SERVICE IS OUR BUSINESS: Qualified engineering staff will translate your problems into practical designs, from idea to finished product—or we'll work from your blueprints. 2 large modern plants with every automatic production facility, 100 in skilled personnel. Fast deliveries—motor, rail, water shipping at the premises.

For prompt, reliable, down-to-earth data and quotations

WRITE, PHONE, WIRE

NYECO

Specialists to the Wire Industries for Over 45 Years

NEW YORK ENGINEERING COMPANY

75 West Street, New York 6, N. Y.

TELEPHONE: WHitehall 4-5380 **CABLE:** NYECO, N. Y. **PLANTS:** YONKERS, N. Y.

These leading mills prefer NYECO Steel Reels: OKONITE, ROEBLING, WESTERN ELECTRIC, GENERAL CABLE, ANACONDA, PHELPS DODGE

Outstanding Personalities of the Wire Industry

New Division Formed by G.E.

Formation of the Chemical and Metallurgical Division within the **General Electric Company** has been announced by **Robert Paxton,** executive vice president of the company.

★ ★ ★

The new Division includes the former Chemical Division and the **Carboloy Department.**

★ ★ ★

Concurrently Mr. Paxton announced the appointment of **Robert L. Gibson** as general manager of the Chemical and Metallurgical Division. Mr. Gibson will make his headquarters in Pittsfield, Mass.

★ ★ ★

Under the new organization arrangement, the former Chemical Division's four operating departments will remain unaffected. Their general managers will continue to report to Mr. Gibson.

★ ★ ★

The Chemical and Metallurgical Division will be made up of five operating departments: Carboloy, Plastics, Silicon Products, Chemical Materials, and Laminated and Insulating Products.

★ ★ ★

Chemical materials and plastics departments are headquartered at Pittsfield, Mass., while Silicone Products and Laminated and Insulated Products Departments are headquartered at Waterford, N. Y., and Coshocton, O., respectively.

★ ★ ★

Kenneth R. Beardslee will retain his present post as general manager of the Carboloy Department. Carboloy Department, formerly the Carboloy Co., has headquarters at Detroit, Mich., and operates plants in that city and at Edmore, Mich. The Department manufactures cemented carbide for the metal working industry, Alnico permanent magnets, Thermistors and Hevimet.

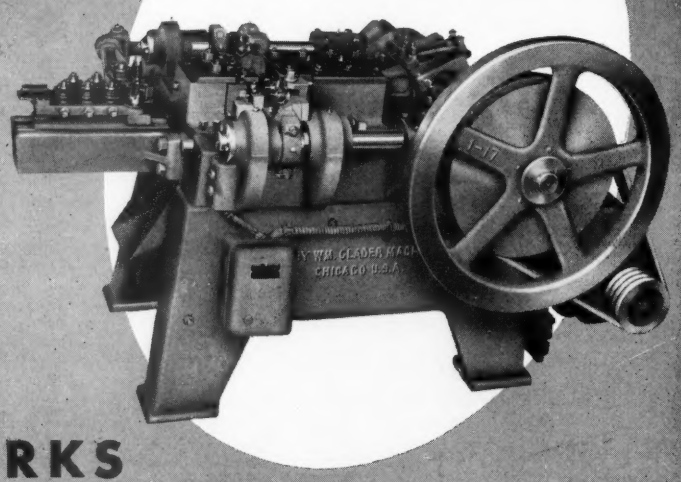
Four Field Engineers Added By Firth Sterling Inc.

To provide for continued expansion of its field engineering service, **Firth Sterling Inc.** has announced the appointment of **W. R. Sutton, J. F. Kroeger, J. L. Zimmerman** and **J. J. Journeycake** as Carbide Service Engineers in the Detroit, Los Angeles, Chicago and Houston Districts respectively.

★ ★ ★

Mr. Sutton attended the Ford Trade School in Detroit where he studied metal-working fundamentals and for twenty years was employed by a major carbide producer in its manufacturing department. In 1936 he became a sales and service engineer and accumulated

high efficiency—low cost with GLADER wire nail machines



Eliminate costly down-time in the Nail Mill by replacing obsolete machines with new GLADER NAIL MACHINES . . . For tops in efficiency and economical operation use GLADERS.

WM. GLADER MACHINE WORKS

210 N. RACINE AVENUE • CHICAGO 7, ILLINOIS

Export Dept.: 122 East 42nd Street, New York 17, N. Y.

extensive experience in servicing direct and distributor accounts in the field.

* * *

Mr. Kroeger is a graduate of a four-year course at General Motors Institute where he was awarded a B. S. M. E. degree. After eight years' employment as a tool and methods engineer with General Motors' Allison Division, he transferred to the West Coast where for the past three years he has been associated with Hydro-Aire and Turbo-Products in engineering assignments.

* * *

For the past two years Mr. Zimmerman had been Estimating Engineer for the East Chicago Machine Tool Company. Prior to that, for a period of seven years, he was associated with Edward Valves Inc. where he progressed from operator and set-up man to Methods and Time Study Engineer. He saw military service in the Air Force.

* * *

Mr. Journeycake's tool engineering background includes ten years with Halliburton Oil Corp. in Oklahoma as a carbide engineer. He later was associated for two years with Machine Tool & Supply Company and for two years with a carbide producer as a sales engineer and district supervisor.

To Head Round Chain Division

James W. Dickey has been named president of the **Ohio Hoist & Mfg. Co.,** Cleveland, and of **Alcaloy Inc.,** Trenton, N. J. He formerly was executive vice president of these two and also of the ten Round chain manufacturing companies which recently were acquired by **Republic Steel Corp.,** and which now are known as Republic's Round Chain Division.

* * *

The twelve companies—most of them with the prefix Round in their corporate names—became affiliated largely because of the reputation of the name and their products in the chain industry. The first of the Round chain companies in the United States was organized 84 years ago by descendants of the Round family, leading chain manufacturers in England for more than 200 years. Standards were high; the name bore a significance, like sterling on silver. Raymond L. Round, grandson of the American founder, has been president and chairman of the boards of these companies. The experienced personnel of all twelve companies remains practically intact and a high type of service is assured. Plants in Republic's division are located in Bridgeport, Conn.; Birmingham, Ala.; San Francisco, Calif.; Los Angeles, Calif.; Seattle, Wash.; Chicago, Ill.; and Cleveland, Ohio; while Ohio Hoist is well established in Cleveland, and Alcaloy in Trenton, N. J.

Made Administrative Assistant

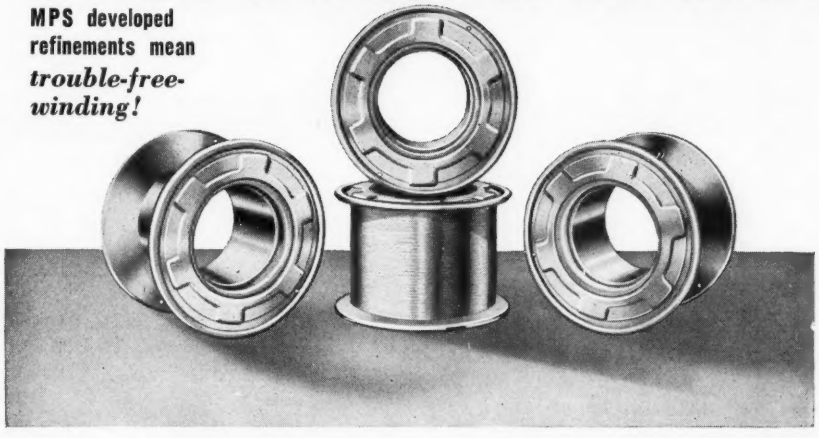
A. F. Franz, president of **The Colorado Fuel and Iron Corporation** has announced the appointment of **John W. McAllister** as ad-

Spool Headaches Eliminated

when MPS HEAVY DUTY NO-CREV SPOOLS

are used in the drawing of the finest wire at high speed

MPS developed refinements mean *trouble-free-winding!*



SIZES

* 6 x 3½ x 3½
6 x 6 x 3½
6½ x 3½ x 3½
6½ x 6 x 3½
8 x 6 x 4½
8 x 8½ x 4½
and others
* Illustrated

Mossberg PRESSED STEEL Corporation

18 WEST STREET

Telephone Attleboro 1-0848

ATTLEBORO, MASSACHUSETTS, U.S.A.

James Day (Machinery), Ltd., 28 Maddox Street, London, W. I. England

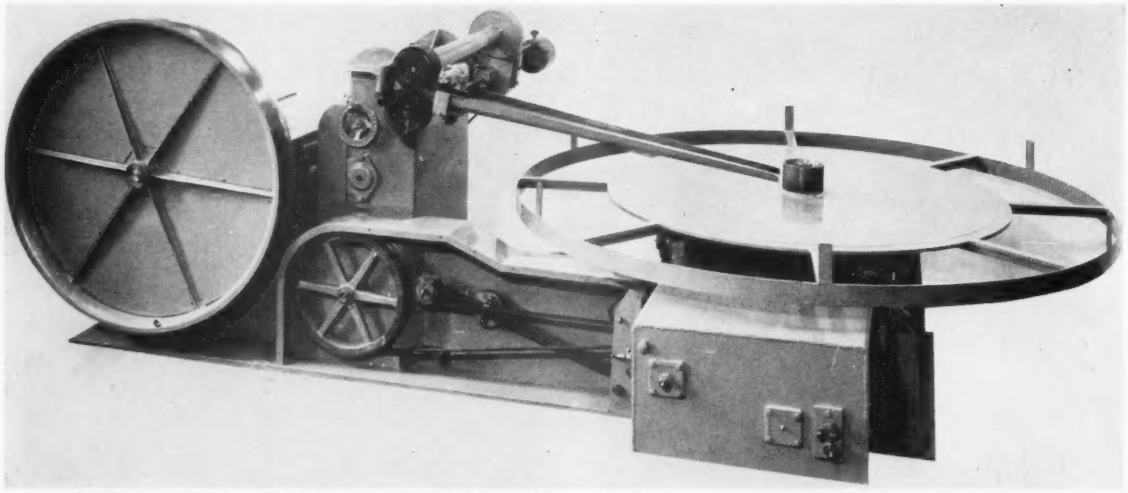
#104

CAMDEN WIRE CO., INC.

Wire Fabricators

MANUFACTURERS OF BARE, TINNED AND SILVER PLATED STRANDED COPPER WIRE, CONCENTRIC OR BUNCHED

40 Masonic Avenue • Camden, New York



SINGLE TABLE PANNING MACHINE NO. 1149

Arranged to Accommodate 80″ Diameter Pans.
Can be Built for Larger Pans.
Cut Shows 42″ Diameter Capstan.
Wire Guide Spout is Stationary.
Table with Pan Traverses. Pan Table is provided with a Lock so that Table can be Released for Hand Panning.
Can be Built as Shown or Opposite Hand.
Not Shown are the Main Variable Drive and also the Guard over the Traverse and Table Drive.

EST. 1855 AIMco INC. 1915

"American" AIM INSULATING MACHINERY COMPANY

REG. U.S. PAT. OFF.

FAIRHILL AND HUNTINGDON STREETS

PHILADELPHIA 33 PENNSYLVANIA U.S.A.

ministrative assistant to the president. For the past several years, Mr. McAllister has been executive secretary to the president and has been responsible for coordinating executive action on many administrative matters that relate to operating, sales and other departments of the Corporation.

★ ★ ★

Mr. McAllister has been associated with CF&I for over 30 years. He was first employed in 1923 as a machinist helper in the coal mines of the company in Southern Colorado. He was later transferred to the Fuel and Steel Operating Departments at Pueblo; then to the general offices of the Corporation in Denver in 1930.

★ ★ ★

In his new assignment, he will continue to maintain offices in Denver.

Carpenter Steel Promotes Two Executives

Two key executives have been promoted by **The Carpenter Steel Company** of Reading, Pa.

★ ★ ★

Douglas R. Beggs, formerly Director of Personnel, has been appointed Assistant to the Vice President—Production, and **Harold W. Miller,** formerly Assistant General Superintendent, has been advanced to Chief Plant Engineer.

★ ★ ★

Mr. Beggs joined Carpenter in 1932 as a machinist apprentice while receiving on-the-job training and education. Before he became Director of Personnel, he was Time Study Man, Time Study Engineer and Director of Time Study. Prior to joining Carpenter, he attended Lehigh University.

★ ★ ★

Mr. Miller joined Carpenter as a chemist in 1937 following his graduation from Albright College. He has served variously as Metallurgical Assistant, Assistant Superintendent—Wire Department, Superintendent Wire Department, and Assistant General Superintendent.

G.E. Appoints Four in Laminated And Insulating Products Department

Four appointments in the General Electric Company's Laminated & Insulating Products Department have been made recently, according to announcements by **Dr. J. J. Pyle,** manager—engineering and **H. A. Howe,** manager — manufacturing for the Department.

★ ★ ★

Dr. Pyle has named **Arthur J. Sherburne** as manager of technical service, **Richard T. Walsh** as supervisor of molded laminated, and **Ronald W. Staley** as supervisor—insulating products engineering; and Mr. Howe has named **Carl A. Drake** as superintendent of the Coshocton plant.

Celanese Promotes Development Department Man

W. D. Morrison has been named Assistant to the Director of the Development Department of **Celanese Corporation of America.** Until his promotion, Mr. Morrison for the last two years was Assistant Manager of the Product Development Department of the Chemical Division of the Company.

THE NEW LOOK

IN DIAMOND DIES

This is what you have been waiting for!
It is the answer to lower production costs.

GET THE UTMOST LIFE AND SERVICE FROM YOUR DIAMOND DRAWING DIES.

NATIONAL WIRE DIE CO.

PRESENTS

THE "NATDI"

The "NATDI" is a reversible Diamond Die.

We waited months for full proof, so that you could be sure of the new die's performance. Customer's report:

1. **UP TO 100% MORE PRODUCTION AT THE INITIAL SIZE.**
2. **AMAZING ABILITY TO BE RE-CUT WITHOUT SKIPPING SIZES. THIS MEANS MORE RE-CUTS PER DIE.**

Our representatives will gladly call on you at your convenience.

NATIONAL WIRE DIE CO.
30 Irving Place, New York 3, N. Y.

Telephones:
GRamercy 3-7622 & 7123

SHOOT 148% X

Added to Kaiser Staff at Newark

John H. Pamperin has been named Assistant to the General Superintendent at the Newark Works, Newark, Ohio of the **Kaiser Aluminum and Chemical Company.** He was formerly associated with Anaconda Wire and Cable Company as Superintendent at Orange, California.

Pittsburgh Steel Appointments

Pittsburgh Steel Company has announced the appointment of **B. R. Hagelbarger** to the newly created position of Central District Sales Manager for its subsidiary, **Johnson Steel and Wire Company.**

★ ★ ★

W. E. Shutt is promoted to District Sales Manager in Pittsburgh Steel's Cleveland District, the position formerly held by Mr. Hagelbarger.

★ ★ ★

C. E. Swallow has been named Works Manager of Johnson Steel and Wire's Akron, Ohio, plant, replacing R. L. Brown who has resigned to take a position with another company.

★ ★ ★

WIRE SPOOLS, ALL-STEEL, LITHOGRAPHED

Ends and traverses may be shipped separately and assembled easily in your plant on a hand, foot, or power press.

5" and 6½" diameter ends with 1-15/16" diameter traverses.

10½" diameter ends with 3½" diameter traverses.

Traverse lengths up to 12".

J. L. CLARK MANUFACTURING CO.

600 23rd AVENUE • ROCKFORD, ILLINOIS

Edwin Brio is appointed Works Manager of the Los Angeles, California, plant of Johnson Steel and Wire, replacing Mr. Swallow. **Robert D. Barnaby** is promoted to West Coast Sales Representative of Johnson Steel and Wire.

Turner & Seymour Adds H&O Wire Forming Division

F. H. Griffiths, President of **The Turner & Seymour Manufacturing Company,** announces the purchase of the **H & O Chain Company** formerly of Norwalk, Connecticut. The complete H & O facilities have been transferred to the T & S plant in Torrington, where its operations will continue as the H & O Division of The Turner & Seymour Manufacturing Company.

★ ★ ★

Among the products which H & O manufactures are wire and flat stock formings, light chain and metal stampings including progressive die work. The combination of H & O with the established T & S plant facilities assures a greater capacity for manufacturing and finishing these products.

★ ★ ★

The Turner & Seymour Manufacturing Company, one of Connecticut's oldest manufacturers, produces gray iron castings, Smith & Egge Chain, escutcheon pins, upholstery nails, thumb tacks, houseware items, bathroom fixtures, and Hidalift window sash balance.

★ ★ ★

Inquiries on wire formings and stampings should be directed to The H & O Division, The Turner & Seymour Manufacturing Company, Torrington, Conn.

U.S. Rubber Man Transferred To Coast

Arthur A. Gingell, sales representative for the electrical wire and cable department of the mechanical goods division, **United States Rubber Co.,** has been transferred to the San Francisco branch, it was recently announced. Mr. Gingell will assume the responsibilities formerly held by the late **Fred D. Benz.**

★ ★ ★

Mr. Gingell, formerly of the Cleveland office, has been a U. S. Rubber salesman since 1941. In 1944 and 1945 he was on special assignment for the Army Air Corps at the company's Los Angeles plant. In 1950 he was transferred to the headquarters office in New York, and the following year he was assigned to the Cleveland branch.

Vaughn Machinery Names New Officers

L. A. Vaughn * * * * *

The Vaughn Machinery Company of Cuyahoga Falls, Ohio, manufacturers of wire drawing equipment, has announced the following changes in their corporate organization, effective immediately:

* * *

L. A. Vaughn, president since 1929, becomes Chairman of the Board.

* * *

James A. Vaughn, Cornell engineering graduate of 1938, formerly vice president, has been named President and General Manager.

* * *

Gordon C. Vaughn has been elected Vice President of Manufacturing.

* * *

Allan Vaughn continues as Secretary of the Company.

* * *

E. J. McIlvried is now Senior Vice President and Director of Engineering. He joined the Company as chief engineer in 1925 and has been vice president and director since 1935.

* * *

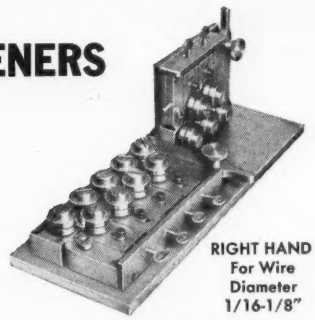
Eugene Daugherty is Vice President of Sales.

* * *

The elections are in line with the continuing growth of the company and the increasing responsibilities of its officers.

James A. Vaughn * * * *

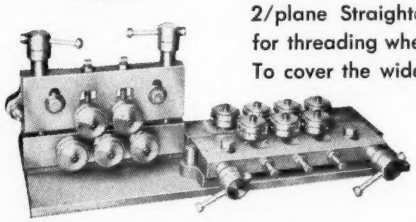
Sjogren 2 PLANE ROLL STRAIGHTENERS



RIGHT HAND
For Wire
Diameter
1/16-1/8"

Sjogren Two Plane Roll Straighteners are fully ball bearing for heavy production duty. They are designed to accommodate all sizes and grades of round or shaped wire whether it be high carbon, low carbon or copper, as well as the many alloys, from .010" to .375". Once set for the job at hand Sjogren 2/plane Straighteners may be opened and closed for threading when making coil changes without effecting the adjustment of the setting. To cover the wide range of wire diameters there are several size groups manufactured with either left or right hand direction. Each is individually produced to exact specifications for the grade, size and type of wire to be processed. Sjogren Two Plane Roll Straighteners do their duty each day, every day in the year.

LEFT HAND
For Wire Diameter
3/16-3/8"



Used by Wire Men Who Want the Best!

SINCE S&S 1927

WIRE PULLERS • WEDGE GRIPS • JAWS FOR ALL MAKES OF PULLERS AND TESTING MACHINES • CAGE ROLLERS • SWAGING HAMMERS • POINTING DIES • WIRE SPOOLERS

SJOGREN TOOL AND MACHINE CO., INC.
Tools for The Wire Industries
14 SWORD STREET, AUBURN, MASSACHUSETTS

AS&W Promotions

John P. Debri, general superintendent of the Joliet Works of **American Steel & Wire Division of United States Steel,** has been promoted to a position in charge of special duties in the office of district manager of operations in Chicago. Succeeding Mr. Debri as general superintendent of the Joliet plant is **Joseph J. Just** who is being transferred from the post of assistant to the general superintendent at the Division's Donora (Pa.) Steel & Wire plant. Succeeding Mr. Just in Donora is **Jacob W. Cox,** who moves up from the position of division superintendent, blast furnaces.

★ ★ ★

Mr. Debri first started working for American Steel & Wire in November, 1908, as a clerk in the accounting department at Joliet. His entire career with American Steel & Wire has been in that city. Since October, 1937, he has been employed in the operating department, moving up through the ranks until April, 1945, when he was appointed division superintendent of the wire mill. He has been general superintendent of the Joliet Works since March, 1953.

★ ★ ★

Mr. Debri has been extremely active in civic affairs in this community, being a member of the Elks, Moose, Wire Association, Joliet Rivals Club, and the Veterans of Foreign Wars.

★ ★ ★

Mr. Just leaves Donora after 20 years' service in that plant. Born in Moon Run, Pa., on March 12, 1905, he first joined United States Steel as a heater helper with the former Carnegie Steel Corp., in Clairton, Pa. With several interruptions for advanced schooling at the University of Pittsburgh, where he earned his B. S. degree in mechanical engineering, he continued working for American Steel & Wire from September, 1925, until March, 1929, when he left to join the Canadian Steel Corp., Ltd. In March, 1934, Mr. Just returned to the Wire Division as a technical apprentice at Donora. He served successively as foreman of the cast billet department and the electric weld and fence department before being named superintendent of the wire and wire products division in April, 1943. He has been assistant to general superintendent since March of last year.

★ ★ ★

Mr. Cox's entire business experience has been with the Wire Division in Donora. After graduation from the Carnegie Institute of Technology in 1936 with a degree of B. S. in M. E., he joined the American Steel & Wire as an observer in the physical laboratory. He advanced through the ranks until, in October, 1948, he was named assistant to superintendent of the Coke Works. Since August, 1949, Mr. Cox has been division superintendent of blast furnaces in Donora.

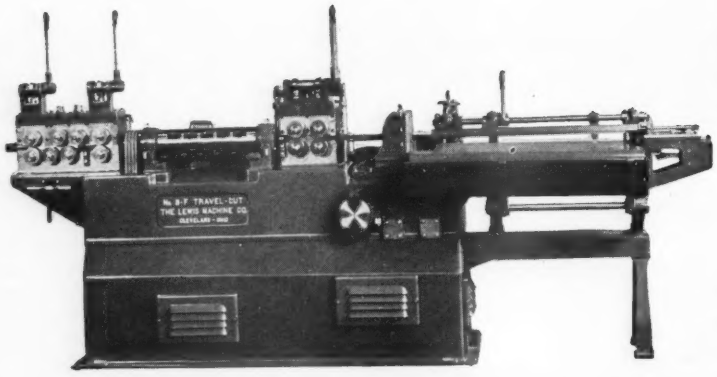
To Direct Manufacturing For Carboloy

Peter J. Jensen has been named manager of manufacturing at **Carboloy Department of General Electric Company,** according to an announcement by **K. R. Beardslee,**

Fast, Accurate, Economical

STRAIGHTENING and CUTTING

with LEWIS TRAVEL-CUT



22 Models to handle from .012" to ¾" Round, Hex, Flat, Shapes.

Simple in design, rigid in construction, Lewis TRAVEL-CUT will deliver continuous dependable service under the most severe, high production conditions—day in, day out. Feeds wire from the coil, straightens accurately, gauges to uniform length, and cuts clean without stopping the wire. For steel, brass, aluminum and alloy wire. Cut your cutting costs with the Lewis TRAVEL-CUT. Full details on request.

Exclusive Representatives

EAST: Penn Machinery Co., 117 North Third Street, Philadelphia 6, Penn.

MIDDLE WEST: Steel & Wire Machinery Co., 15457 Euclid Ave., Cleveland 12, O.

CENTRAL: Moslo Machinery Co., 2443 Prospect Avenue, Cleveland 15, Ohio.

WEST COAST: Hoffman & Heartt, 3005 So. Grand Ave., Los Angeles 7, California.

CANADIAN: Empire Engineering Co., 738 Dundas St., East, Toronto, Ont., Canada.

CONTINENTAL EUROPE: Gaston E. Marbaix Ltd., Devonshire House Vicarage Crescent, London S. W. 11, England.

The LEWIS MACHINE Company

3441 E. 76th Street, Cleveland 27, Ohio

Also agents in Paris, Stockholm, Rotterdam, Brussels, Zurich, Milan, Bombay and Melbourne

general manager.

★ ★ ★

Except for 22 months in the Army Ordnance Corps, Mr. Jensen has been manager of Carboloy's Michigan sales district since September, 1948. As a lieutenant colonel, he was chief of the weapons branch of Detroit Ordnance District. He won two service commendations while chief of the small arms branch of that district from 1941 to 1946.

★ ★ ★

On return from military duty in 1946, he served as executive engineer in the Carboloy engineering and research department until he was named Michigan district sales manager.

★ ★ ★

Mr. Jensen graduated from the University of Nebraska in 1936 as a mechanical engineer. He joined the Carboloy Department as a tool engineer in 1937, after a year in Schenectady on General Electric's test course.

★ ★ ★

John A. Muldoon succeeds him as manager of the Michigan Sales District. Mr. Muldoon's first position with Carboloy Department was general foreman of the die department, 1937-42. After two years in production control he was named assistant to the vice-president in charge of manufacturing. He has served since October, 1950 as manufacturing manager.

Join Facile Corporation

Carl N. Hellman has joined the research and development staff of **Facile Corporation,** Paterson 4, N. J., as a chemical engineer, according to a recent announcement. He was formerly with **E. I. DuPont de Nemours & Co., Inc.**

★ ★ ★

Ralph R. Hull has been appointed general supervisor of sales for the Corporation, who manufacture reinforced laminated materials for the decorative and industrial trades.

★ ★ ★

The newly-created position which Mr. Hull assumes is part of the current expansion program of the firm. Mr. Hull was formerly with Minnesota Mining and Manufacturing Company, St. Paul, Minn.

Moved to Hartford by Union Drawn Steel

Appointment of **James M. Kelly** as plant industrial engineer at the East Hartford plant of **Republic Steel Corporation's Union Drawn Steel Division** was announced by **Harry B. Matzen,** superintendent.

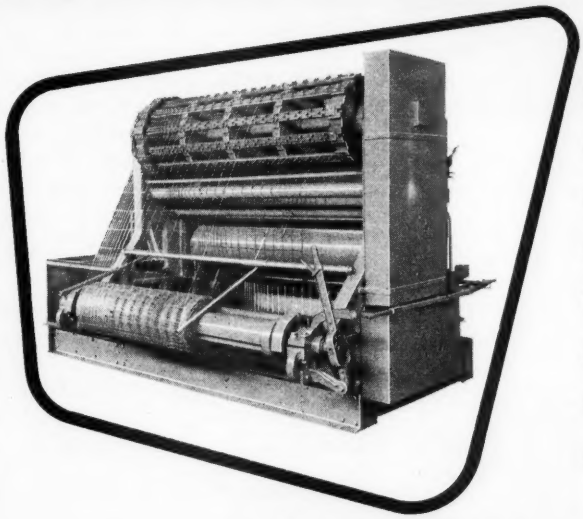
★ ★ ★

He succeeds **Ralph V. Darragh,** who has been appointed industrial engineer for the five-plant Union Drawn Division.

★ ★ ★

A native of Windsor, Conn., Mr. Kelly attended Trinity College in Hartford. From 1939 to 1951 he worked at Union Drawn's East Hartford plant in clerical and industrial engineering capacities.

Interlocking FENCE LOOMS



- Fastest — Most Efficient
- Preferred by Leading Mills
- Low Maintenance Cost
- Wrapped Stay Fence
- Straight Stay Wires
- Integrated — Space Saving
- Replaceable Main Bearings
- Single or Double Strands
- Years of Low Cost Production

Write for Detailed Information — Without Obligation

Interlocking Fence Co., Box 8, Morton, Ill.

Specialists In Fence Looms

For the last three years, Kelly has been working on a special industrial engineering project from Division headquarters in Massillon, Ohio.

Old Friend Heads Hotel Management Group

M. P. Mathewson, Sales Director of the **La Salle Hotel** in Chicago, has been elected President of the Illinois Chapter of the Hotel Sales Management Association, succeeding **Bob Stein** of the Shinderman Hotels.

Elected Vice President of Farrel-Birmingham

Farrel - Birmingham Company, Inc., Ansonia, Conn., has announced the election of **Donald A. Comes** as vice president. He will also continue to hold his present position as general sales manager.

★ ★ ★

Mr. Comes has been connected with Farrel-Birmingham since 1922. He was a sales representative in the New Jersey territory for a number of years and was particularly active in developing the use of Banbury mixers in the rubber, plastics, linoleum, paint and other industries.

★ ★ ★

In 1943 Mr. Comes was transferred to the main office at Ansonia, as manager of the Banbury Mixer Department. In 1946 he was promoted to the position of assistant general sales manager and in 1953 was named general sales manager.

Rem-Cru Titanium Opens New Office Building

C. I. Bradford, president and general manager of **Rem-Cru Titanium, Inc.,** announced the official opening of a modern air-conditioned office building in Midland, Pa.

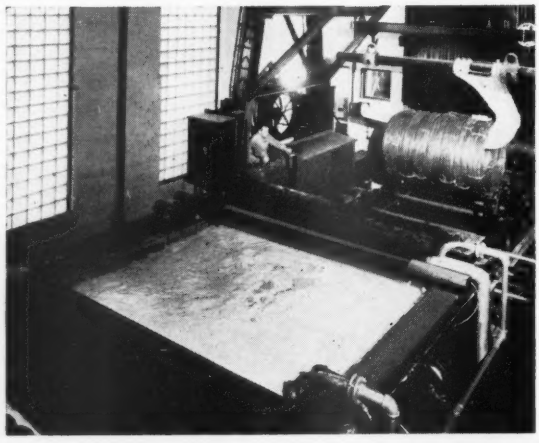
★ ★ ★

Rem-Cru Titanium, Inc., owned by **Remington Arms Company, Inc.,** and **Crucible Steel Company of America,** is one of the country's leading producers of titanium. This joint venture was undertaken in 1950 while titanium processing was still in the pilot-plant stage. During the past four years, ingot size has increased from 50 to 4,000 pounds. Rem-Cru processes these into sheets, strips, billets, bars, wire and tubing for fabrication into aircraft parts and many non-military applications where strength-weight ratio and corrosion resistance are important factors.

★ ★ ★

The new building is identified by an illuminated titanium metal sign—the first of its kind. The individual one-foot high letters are fabricated from polished titanium sheet.

To INCREASE Your Pickling Tonnage . . .
. . . Use HEIL Steam Jet Agitators



A typical wire mill pickler completely outfitted with HEIL E-3 Type Steam Jet Agitators.

The majority of pickling operations throughout this country and Canada have selected Heil Steam Jet Agitators to increase pickling production at lower cost per ton. Violent agitation and proper heating of pickling solution in one simple operation will save valuable time and money.

1. LONGER SERVICE LIFE The combination of special lead alloy and patented nozzle provides rugged construction for longer service life. No breakage from thermal shock.
2. LOWER INITIAL COST Standard Pre-engineered units are available to meet your specific requirements. No down-time necessary for installation.
3. CHOICE OF MATERIALS Standard units are available in either lead alloy for sulphuric acid or impervious graphite for muriatic and mixed acid solutions.
4. YOU SAVE ACID Uniform agitation at higher obtainable temperatures allows you to pickle at lower concentration and thus stretch your acid consumption.

External Shell and Tube Exchangers available for continuous pickling.

Write for illustrated literature and Bulletin No. 43-W.

CHEMICAL-PROOF LININGS · TANKS HEATERS PLASTICS

Representatives in all Principal Cities

HEIL PROCESS EQUIPMENT CORPORATION

12901 Elmwood Avenue • Cleveland 11, Ohio

Other Heil Products: Pickling Tanks • Lined Fume Removal Systems
Acid-Proof Maintenance Materials • Syphons • Lined Acid-Proof Piping

Patronizing Our Advertisers

These are the progressive concerns who stand behind their products and have reputations worth sustaining and you can depend upon them.

Catalog Corrosion-Proof Materials

The Ceilcote Company, 4846 Ridge Road, Cleveland, Ohio, has announced a new catalog: "Complete Corrosion-Proofing Service for Industry." In concise form it presents comprehensive information on a complete line of corrosion-proof linings, bricks, bonding cements, protective coatings and mastic floors. Manufactured from a variety of base formulations, these materials have different chemical and physical properties that will meet the requirements of a wide range of industrial applications.

★ ★ ★

The services rendered by The Ceilcote Company also are outlined. These include furnishing materials, supervision for the installation, or contracting for the complete job including labor, materials, equipment and supervision. A trained installation department is equipped to handle field applications for corrosion-proofing fume ducts, tank linings, floors, foundations, piers, pits, trenches, waste disposal systems and other installations. In addition, laboratory facilities are available to assist in the development of specialized materials for unusual applications.

★ ★ ★

To facilitate selection of the correct lining, cement, brick or coating, a comprehensive chart is included. This covers application method, general uses, temperature resistance, base formulation, resistance to nineteen commonly encountered chemicals, and other data on each product.

★ ★ ★

Catalog No. G-201 will be sent upon receipt of letterhead request or publication inquiry.

Firth Sterling Announces New Cutting Material

Firth Sterling Inc. announces the development of a new carbide cutting material which contains no tungsten and no cobalt. Four years ago, Firth Sterling metallurgists studied English, Austrian and German Techniques of producing titanium carbide, the basic ingredient of this new compound. Having adapted the best features of these European processes, Firth Sterling, through extensive research, has developed a superior titanium carbide cutting material. The development is of considerable interest because, in critical times, it will release tungsten for other purposes.

★ ★ ★

These tungsten free materials have a titanium carbide base in place of tungsten carbide. Nickel is used as a binder instead of cobalt and molybdenum carbide is used as an alloy carbide addition.

The tungsten free grades are characterized by high wear resistance and the cratering action of steel chips is greatly reduced. Tool life is excellent on steady finishing cuts, particularly when high speeds and fine feeds are employed in machining hard abrasive steels. They remain much cooler than tungsten carbide grades when cutting steel without fluids.

★ ★ ★

The company stated that the material is now available in limited quantities and prices will be quoted on request.

FORMED COMPLETE-*AUTOMATICALLY!*

NILSON FOUR-SLIDES

Combine Operations to Lower Costs on Metal Stampings.

ONE Nilson 4-Slide with ONE operator forms parts *faster,* more *accurately* with less *rejects* than with conventional presses. Elimination of secondary handling, lower tooling and set up costs *means added profits.* Wide range of models for wire and ribbon metals. Feed lengths to 32", stock widths to 3½". Press capacity to 75 tons.

For specific recommendations — send details of your operation.

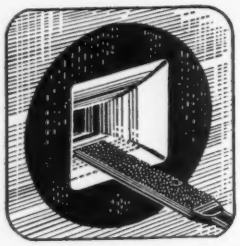
THERE'S NILSON *NOTHING LIKE A*

Write, Wire, Phone for full particulars.

THE A. H. NILSON MACHINE COMPANY

1516 Railroad Avenue • Bridgeport 5, Connecticut

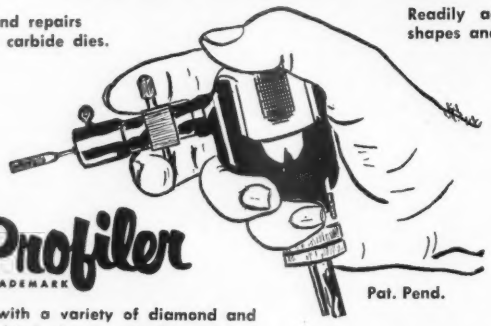
Automatic Chain-Making Machines • Automatic Staple Forming Machines • Wire and Strip Reels • Foot Presses • Wire Straightening Equipment • Slide Feeds for Presses



ELIMINATE the "ELBOW GREASE" in TOOL and DIE MAKING

Makes and repairs tungsten carbide dies.

Readily adapts to special shapes and contours.



SHARPENS
GRINDS
FILES
SCRAPES
HONES
LAPS
SAWS
STONES
CUTS
FINISHES
POLISHES

the * **Di-Profiler** TRADEMARK Pat. Pend.

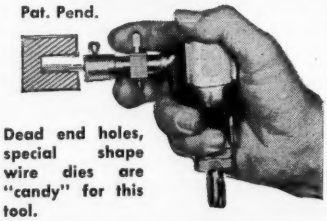
is furnished with a variety of diamond and needle files, chisels, burrs and other units of many intricate shapes, thereby reducing the tool and die maker's problem of special tools (made on your time) by 90%.

The *Di-Profiler can be used for repairing dies, even without removing from machine. You can hold your files absolutely level for straight holes and provide an oscillating motion for contour. The reciprocating action does the work at a stroke ranging from 0" to ¼", without vibration because of the high precision of the tool. Once you see it—you'll never be without the *Di-Profiler. Write for full details and ask for a demonstration.

SAVE YOUR TOOL MAKERS AND MAINTENANCE MEN BY PROVIDING TOOLS TO DO THE HARD, TIRING PART OF THEIR WORK.

*DI-PROFILER ELIMINATES THE HARD "ELBOW GREASE" WORK.

Pat. Pend.



Dead end holes, special shape wire dies are "candy" for this tool.

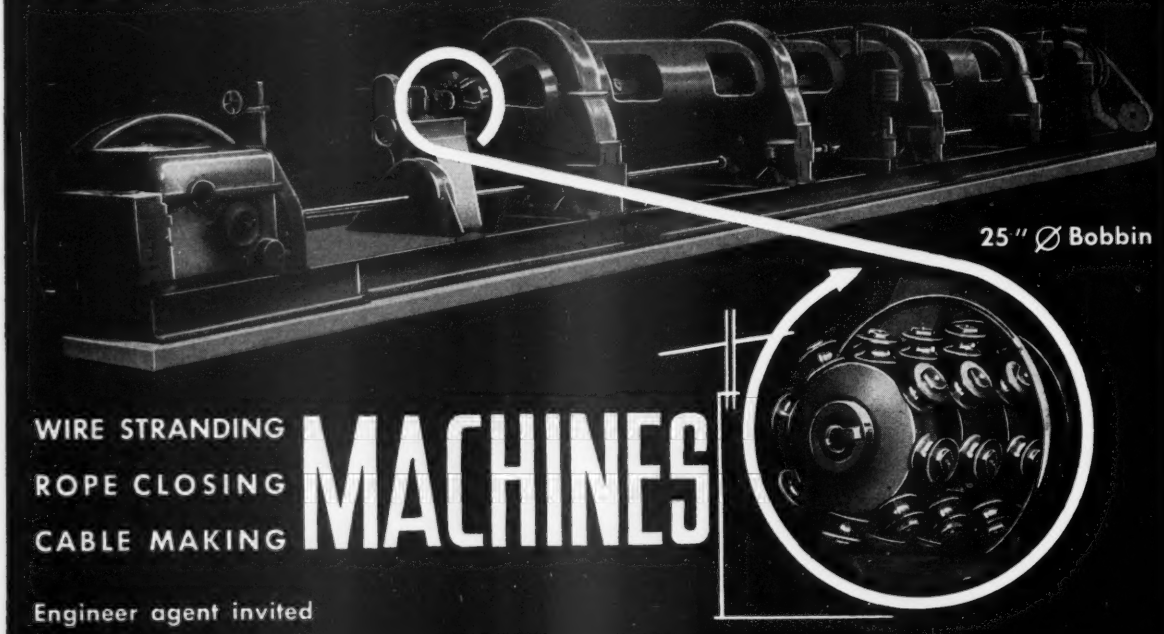
Everything comes in an attractive mahogany finished box — except the flexible shaft, rotary attachment and motor.

Nord International Corp.

449-W CENTRAL AVENUE, ORANGE, NEW JERSEY

*An exclusive Nord Trade Mark

NIEHAUS High-Speed Tubular Stranding Machine



WIRE STRANDING
ROPE CLOSING
CABLE MAKING

MACHINES

Engineer agent invited

MASCHINENFABRIK K. A. NIEHAUS · GERMANY
DÜSSELDORF-RATH

A Review of Recent Wire Patents

No. 2,682,973, MACHINE FOR DELIVERING PREDETERMINED QUANTITIES OF SCREWS OR OTHER HEADED ROD-LIKE ARTICLES, patented Juy 6, 1954 by Alfred George Ballard, Birmingham, England, assignor to G. K. N. Group Services Limited, Smethwick, England, British company.

The screws are directed along a number of inclined parallel slots the lowermost screw in each slot is separated from the others and gates at the mouths of the slots are opened simultaneously to discharge the separated screws.

★ ★ ★

No. 2,683,000, DISPENSING REEL FOR TIE WIRES, patented July 6, 1954 by George E. Beiderwell, Paducah, Ky.

A tie wire dispensing device is disclosed constructed to be suspended and supported from a belt extending horizontally around the body of a workman.

★ ★ ★

No. 2,683,472, METHOD OF MANUFACTURING PERFORATED METALLIC TAPE FROM WIRE, patented July 13, 1954 by Harry G. Specht, Montclair, N. J.

The method is a continuous one and comprises feeding and simultaneously working a number of wires arranged in side-by-side relationship in a common plane to form projections on each wire these projections extending transversely of the plane, rotating the wires to orient the projections to serve as spacer abutments against adjacent wires, drawing the wires under tension through a guide means having walls defining a rectangular confining opening having the width and thickness dimensions of the tape to prevent relative rotative displacement of the wires, and heating the wires to secure the contacting surfaces thereof.

★ ★ ★

No. 2,684,050, APPARATUS FOR COATING CABLES patented July 20, 1954 by Elmer J. Larsen, Parkville, and Charles W. Ruth, Baltimore, Md. assignors to Western Electric Company, Incorporated, New York, N. Y., a corporation of New York.

In a cable core covering apparatus including an elongated tubular barrel through which a cable core to be covered may be advanced and a die at the exit end of the barrel for forming a sheath on the cable core the inventors provide a new applicator for applying liquid coating compound to the core.

★ ★ ★

No. 2,684,070, SURGICAL CLIP, patented July 20, 1954 by Walter L. Kelsey, Portland, Ore.

A surgical clip is disclosed, comprising a single length of relatively stiff deformable wire. There are eleven claims.

★ ★ ★

No. 2,684,087, MACHINE FOR MAKING WIRE FABRIC, patented July 20, 1954 by Raymond F. Stockton, Sunland, Calif.

The machine is arranged for forming a mesh fabric from a single length of wire.

★ ★ ★

No. 2,684,421, APPARATUS FOR FORMING TERMINALS AND ATTACHING SAME TO WIRES, patented July 20, 1954 by Roy P. Hipple, Warren, Ohio, assignor to General Motors Corporation, Detroit, Mich., a corporation of Delaware.

Apparatus for forming a terminal clip from a metal strip and attaching the clip to an electrical wire is disclosed.

★ ★ ★

No. 2,684,422, CHAIN WELDING MACHINE, patented July 20, 1954 by Paul Esser, Koln-Raderberg, Hans Stutzer Koln-Bickendorf, and Alfred Gremm, Koln-Sulz, Germany, assignors to Meyer, Roth & Pastor, Koln-Raderberg, Germany.

This machine is for electric resistance butt-welding of wire and rod chain links.

★ ★ ★

THE BEST FOR COVERING...

The ***POURTIER*** *High-Speed*

INDIVIDUAL INSULATING MACHINES

INDIVIDUAL HEAD, handling wire sizes of 7 to 32 A.W.G. Other models made with up to four (4) serving bowls.

POURTIER MACHINES will serve cotton, paper, cambric, fiberglas, silk, nylon and cellulose acetate at speeds of 4500 r.p.m.

EQUIPPED WITH:

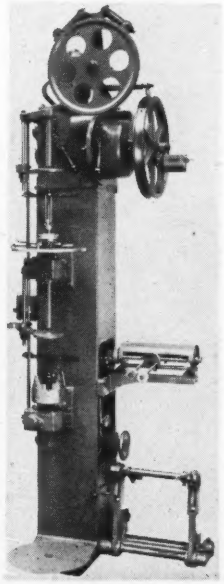
9 speed gear box for the haul-off capstan, automatic central lubrication and slow starting mechanism. Speeds easily changed. Bowls with compensator controlling the unrolling of the bobbin and a quick stopping device, in case of breakage of insulating material. Special control to change the direction of the motion of the heads. Traverse motion's speed and displacement easy to set up.

Machines are built to meet AMERICAN STANDARDS

SHORT DELIVERIES — LOW PRICES

POURTIER MACHINES

153 RUE GALLIENI, ROMAINVILLE-SEINE, FRANCE



INSULATING MACHINE IM 402

For the U. S. exclusively for I. M. Machines, address inquiries to FIDELITY MACHINE CO., Inc. Philadelphia, Pa.

For other machinery, send inquiries to POURTIER MACHINES. See address at left.

No. 2,684,423, APPARATUS FOR FORMING TERMINALS AND ATTACHING SAME TO WIRES, patented July 20, 1954 by Roy P. Hipple, Warren, Ohio, assignor to General Motors Corporation, Detroit, Mich., a corporation of Delaware.

The apparatus is for use with a punch press having a fixed bed and a movable ram and a device for intermittently feeding strip metal lengthwise.

★ ★ ★

No. 2,684,512, WIRE BINDER, patented July 27, 1954 by Ward W. Beman, Glendale, Calif., assignor to Telecomputing Corporation, Burbank, Calif., a corporation of California.

A device for tying together a group of wires is disclosed, comprising a flexible strip of uniform cross-section positioned adjacent and extending along the group, a number of flexible arms extending from opposite sides of the strip, a hook positioned at the end of each arm, and a cord passing around the hooks to hold the arms against the group, this strip being flexible enough to follow turns in the group by either bending or twisting.

★ ★ ★

No. 2,684,694, MACHINE FOR MAKING WIRE FABRIC, patented July 27, 1954 by Albert L. Stoeckel, Euclid, Ohio, assignor to Wean Equipment Corporation, Euclid, Ohio, a corporation of Ohio.

This machine includes rotary twisters to which mesh and selvage wires arranged in generally side-by-side relationship are fed to twist wires together and make a strip of wire fabric with selvage edges, the twisters being arranged in a number of series with the twisters of each series arranged in generally side-by-side relationship and the respective series generally parallel.

★ ★ ★

No. 2,684,844, SINUOUS TYPE OF SPRING WITH VARIABLE LENGTHS OF TRANSVERSE AND LONGITUDINAL BARS, patented July 27, 1954 by Hyland C. Flint and Richard J. Williams, Birmingham, Mich., assignors to American Metal Products Company, Detroit, Mich., a corporation of Michigan.

A spring strip is disclosed for a seat having a main load bearing area made of a wire bent back and forth into a sinuous form providing straight lengths of edge spacing bars joined at right angles to parallel transverse torsion bars the spacing of which is controlled by the length of the spacing bars, which lengths are varied to conform to the load to be supported by the spring strip in order to produce a predetermined desired contour in the strip under load.

★ ★ ★

The information in this section is furnished by the patent law offices of LANCASTER, ALLWINE & ROMMEL, 438 Bowen Bldg., Washington 5, D. C. Data listed is only a brief review of recently issued patents obtained by various U. S. Pat. Off. registered attorney for manufacturers and/or inventors. Complete copies may be obtained direct from Lancaster, Allwine & Rommel by sending 50¢ for each patent desired. Outside of the U. S. and Canada the cost is $1.00 for each copy.

Armco Installing Bar Rolling Mill in Baltimore

Armco Steel Corporation will begin immediately on a $5½ million project to install new rolling facilities at its Baltimore Works, **W. W. Sebald,** Armco president, has announced.

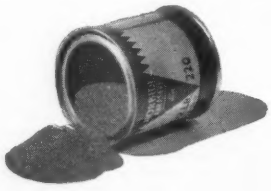
★ ★ ★

"The project will consist of a bar mill especially designed to roll stainless steel in a wide variety of sizes and grades. The mill will be housed in a new 550-foot building, and it is estimated the project will be completed in about eighteen months," Mr. Sebald said.

★ ★ ★

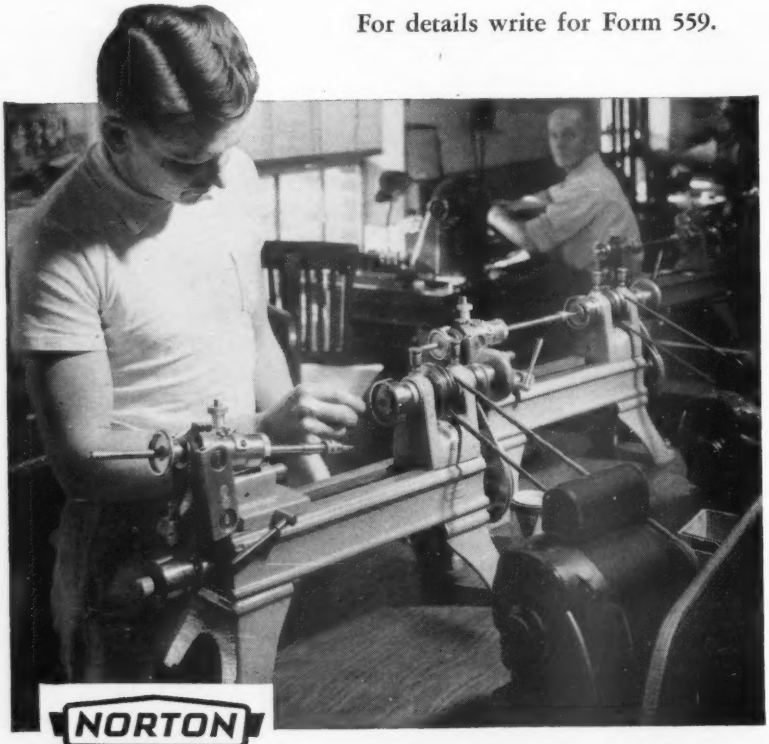
The Baltimore Works of Armco is the largest plant in the world exclusively devoted to the production of stainless steel.

Save Money with NORBIDE® Abrasive . . .



Are you still using costly diamond dust for refinishing your wire drawing dies? Many wire mills are saving money by using NORBIDE Abrasive for ripping or fast stock removal as well as for accurate semi-finishing operations.

For details write for Form 559.



NORTON
BORON CARBIDE

NORTON COMPANY
45 New Bond Street • Worcester 6, Massachusetts

NORBIDE® . . . the hardest man-made abrasive

New Nail Making Development By Stelco

A new process for the manufacture of threaded, or spiral nails, which may make them the common wood fasteners of the future is announced by **The Steel Company of Canada, Limited.** This process is applied to the wire from which the nail is later made as a continuous mass production operation as distinct from the costly method which has previously been in general use of threading each individual nail.

★ ★ ★

The trade name "Ardox" has been registered by Stelco to be applied to this new spiral nail which is now being marketed.

★ ★ ★

The "Ardox" nail is threaded to the head following the well known and widely accepted principle of obtaining greater nail holding power through the use of a threaded shank. Threaded nails have been recognized for the last several years as a great improvement over the common nail, but the high cost of production has made their universal application prohibitive. The newly developed process reduces this cost very substantially and places the new nail in the price range of the common nail.

★ ★ ★

This development is the result of research and tests extending over the last year and a half, undertaken by The Steel Company of Canada, Limited because of a recognition that the straight shank nail presently used relying for its holding power on the friction of its smooth shank against the sides of a hole punched in the wood, is a very primitive fastener. The "Ardox" nail is the most recent in a chain of developments on common wood fasteners going back to Biblical times.

New York Wire Cloth Launches Product Diversification Program

An intensive product diversification program has been initiated by the **New York Wire Cloth Company** of New Canaan, Connecticut, and York, Pennsylvania, the nation's oldest and largest manufacturer of insect screening, it was announced this summer by **Louis D. Root, Jr.,** President.

★ ★ ★

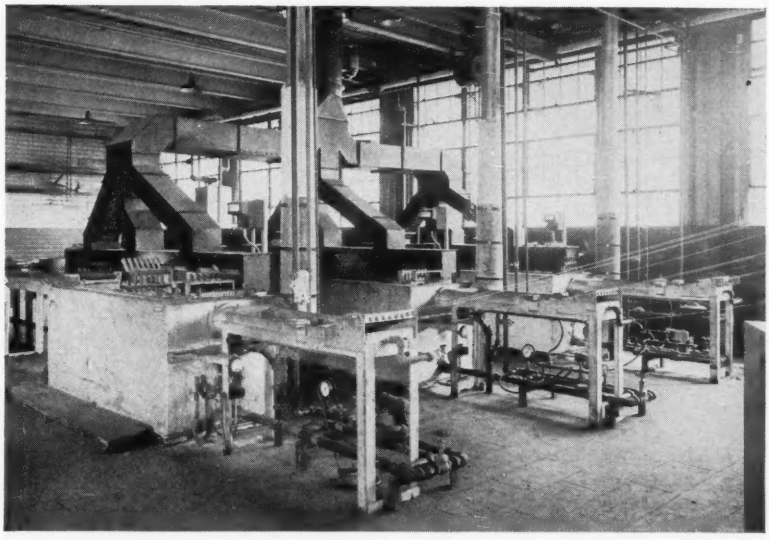
J. Slater McHugh, of Fairfield, Connecticut, will head up the newly-established New Business Development Department. He will report directly to the President.

★ ★ ★

Mr. McHugh of Fairfield, Connecticut, comes to New York Wire Cloth after three years with the Boots Aircraft Nut Corporation of Norwalk, Connecticut, as Manager of New Products Division. Prior to that, he spent three years as manufacturer's representative for hardware and houseware lines and before that had served several years with General Foods in sales promotion.

1,000,000,000 Pounds of Nickel

More than one billion pounds of nickel were delivered to the free world by International Nickel, world's largest producer of the metal, in the four-year period, 1950 through 1953.



for Tinning Fine Copper Wire

These Rockwell high speed, automatically controlled furnaces handle multiple strands of fine wire in a continuous fluxing, wiping, tin coating, quench and rewinding process at a production rate of 8800 lbs. per hour.

Similar Rockwell wire processing equipment has been designed for application of other metal coatings, galvanizing and for lead annealing.

It will pay you to investigate Rockwell's experience in the heat treatment of ferrous and non-ferrous wire and strip.

ROCKWELL ALSO BUILDS

- Complete processing equipment for enameling, tinning, glass coating or synthetic coating magnet wire.
- Batch or conveyor type ovens, electric, fuel or steam heated, for aging, annealing, drying or baking insulated magnet wire.
- Batch or continuous, electric and fuel-fired furnaces, direct heated, muffle or radiant tube type for annealing, bright annealing, hardening and drawing.
- Gas generators to provide protective atmospheres for bright annealing.

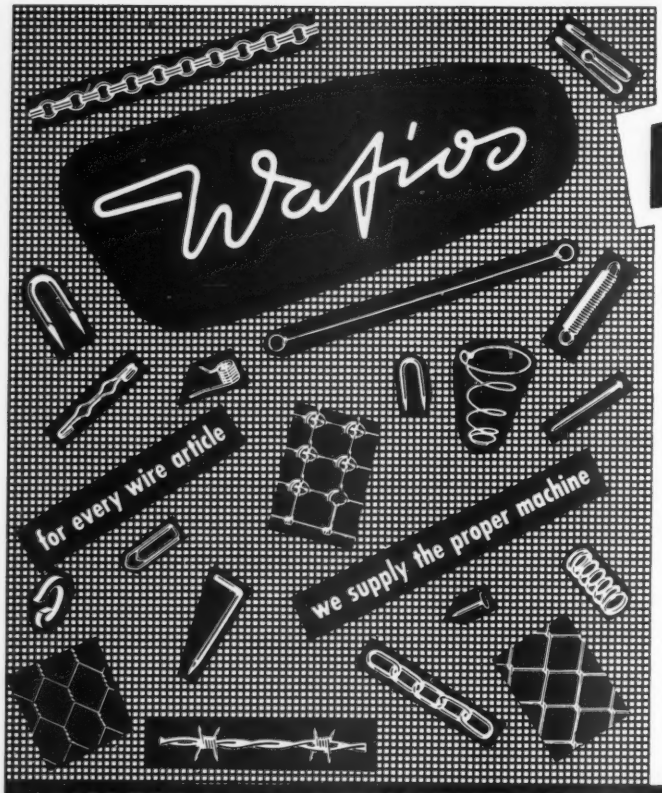
ROCKWELL SINCE 1888 BUILT

W. S. ROCKWELL COMPANY

FURNACES • OVENS • BURNERS • VALVES • SPECIAL MACHINERY

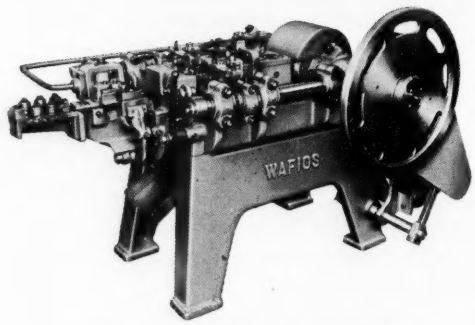
2424 ELIOT STREET • FAIRFIELD, CONN.

Sales Representatives in Principal Cities



AUTOMATICS

FOR THE WIRE TRADE



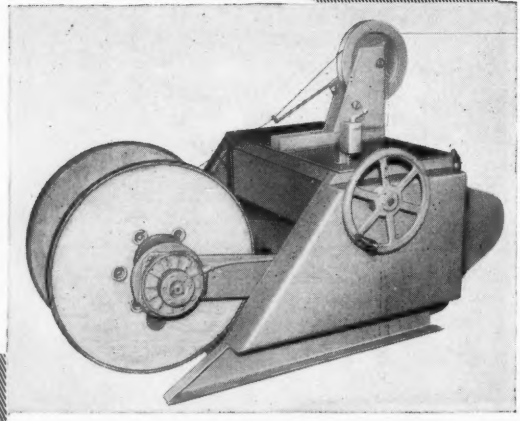
HIGH SPEED WIRE NAIL PRESS
9 different sizes. Wire diam. range: SWG 22-3
Length of nails: ¼-12″

Sole Agents: Kurt Orban Co., Inc.
205 E. 42nd St., New York 17, N. Y.
Telephone: Murray Hill 4-7700. Cables: ORBONOK, N. Y.

WAFIOS MASCHINENFABRIK REUTLINGEN 3 / GERMANY

WIM *Shaftless Payoff Stand*

The WIM Shaftless Adjustable Tension Payoff Stand is one example of the conservative design and precision engineering in WIM wire handling equipment. Here is a smooth handling, high speed machine featuring operating simplicity and dependable performance. Let our engineers, with their successful experience in wire handling, help you with your problems. Write today for further information.



WIM Shaftless Adjustable Tension Payoff Stand

WIRE INSULATING MACHINERY, INC.

Division of Machinery Electrification, Inc.

Northboro Mass., U.S.A.

Wire of Intricate and Unusual Cross-Section Offered

Designers, laboratory technicians, spring manufacturers and engineers who work with wire in various forms will be interested in the special, intricate wire shapes available from the **Heli-Coil Corporation** of Danbury, Conn. Numerous wire shapes in cross-section can be produced.

★ ★ ★

The formed wire is available in sizes ranging from a maximum cross-section of 3/16" diameter down to a minimum of .015" diameter and in various metals.

★ ★ ★

Tolerances can be held to .0002 of an inch and surface finishes from 8 to 15 micro-inches can be produced. Hardness up to Rockwell-"C" 50 can be obtained in metals which can be work-hardened.

★ ★ ★

The Heli-Coil Corporation presently produces millions of wire thread inserts per year in diamond cross-sections formed of stainless steel and phosphor bronze for the protection of threads in soft materials such as plastics, wood, aluminum, magnesium as well as iron and steel. In addition, special wire forms in Hastelloy "C", music wire and other metals can be produced.

★ ★ ★

This wire-forming service offered by the Heli-Coil Corporation is designed to supplement the work of regular wire mills but is not intended to provide fabricated end products.

★ ★ ★

Special wire forms are furnished in lengths on spools, reels or in individual coils.

New Cable Ripper and Wire Gauge

An improved tool for ripping the outer covering of non-metallic sheathed cable including small type "T" has been developed by Holub Industries, Inc., Sycamore, Ill.

★ ★ ★

The cable is merely slipped in, the handles are squeezed together, then a pull cuts the sheathing as far as desired. In the case of long ripping, there is no time lost in feeding the cable end through a narrow area because this tool is designed with an offset end past which the cable slides.

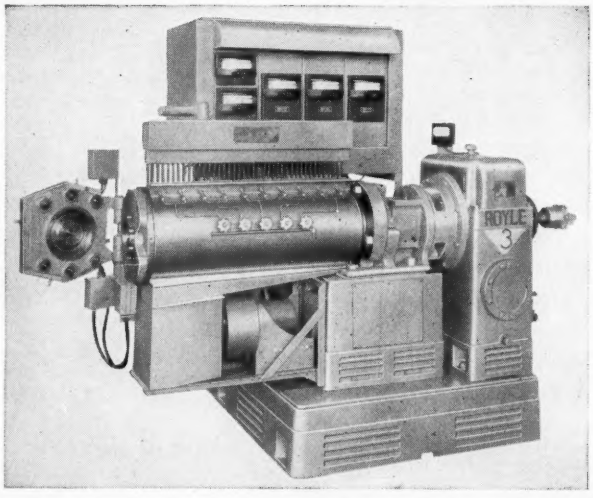
★ ★ ★

Other improvements include long handles for a good grip, cadmium plating to prevent rusting and accurately stamped holes in the handle to measure wire sizes from Nos. 14 to 6.

★ ★ ★

The Ripper is made of steel with case hardened cutting point for long life. All cutting edges are smooth, preventing cutting of fingers. Overall length is 5". Send for Cat. No. Hi-225. Distribution throughout Canada is through Verd-A-Ray Electric Products, Ltd., Montreal 9.

FASTEST HEATING FASTEST COOLING



Here are some of the time-tested, money-saving reasons more and more plants are standardizing with Royle Spirod* Extruders for processes requiring maximum flexibility in controlled temperatures — constantly maintained and accurately zoned:

- **Extra heavy walled cast steel cylinders that will not warp. No joints to leak when pressures are high or crevices to collect burned compound that would cause contamination.**
- **Heavy duty large diameter heating elements, that can be used with 440 volts without step-down transformers, provide radiant heat to cylinders and heads.**
- **Any heating element may be removed and replaced without disturbing other elements or wiring.**
- **A cooling system with ten times the capacity of conventional designs can be modulated through its entire temperature range without drastic changes. Ample cooling for all compounds at maximum speeds.**

No. 3 Royle Spirod Extruder. Completely insulated and equipped for evaporative cooling.

*Patent Applied For

JOHN ROYLE & SONS

ROYLE PATERSON N. J. 1880

PIONEERED THE CONTINUOUS EXTRUSION PROCESS IN

London, England — James Day (Machinery) Ltd. REgent 2430
Home Office — V. M. Hovey J. W. VanRiper SHerwood 2-8262
Akron, Ohio — J. C. Clinefelter SWandale 4-5020
Los Angeles, Cal. — H. M. Royal, Inc. LOgan 3261

PATERSON 3, NEW JERSEY

Floating Gearmotor

The Philadelphia Floating GearMotoR was developed in response to the long felt need for a roll or conveyor drive that is entirely self-contained and located at the point where the power is required. The elimination of long lines of shafting and open gearing or complicated gearmotor drives requiring special baseplates and couplings is considered essential to modern conveyor installations.

★ ★ ★

The Floating GearMotoR reduces power transmission to its simplest terms. The compact Gear Unit and Motor mount directly on the driven shaft. There can be no misalignment, as the power unit becomes an integral part of the driven shaft. A simple torque arm prevents the gear unit from rotating. The floating GearMotoR can be mounted in almost any location or position due to its compact design. The right angle worm and worm gear arrangement permits the entire unit to nestle close to the driven machine. Gearing is liberally proportioned for 300% peak loading over normal ratings.

★ ★ ★

The GearMotoR fulfills these needs in a standardized high torque unit providing a range of output speeds from 8 to 800 RPM with integral electric motors ranging from 1 to 15 horsepower. When compared to other methods of powering steel mill run-out tables, conveyors, and other driven machinery the drive provides an efficiency and versatility not otherwise attainable. Initial cost is relatively low while savings in maintenance and downtime provide further savings in future years of operation.

★ ★ ★

For an 8-page catalog #F-54 describing the drive and its applications, write to the **Philadelphia Gear Works,** Erie Avenue and "G" Street, Philadelphia 34, Pa.

New Alkaline Deruster Announced by Oakite

Oakite Products, Inc., manufacturers of specialized cleaning and allied materials, have announced the development of Oakite Rustripper, designed for alkaline derusting of precision parts where dimensional change and acid embrittlement must be avoided. In addition to removing rust and heat scale from ferrous metals, this material has also proved effective in certain cases for descaling heat-treated titanium in aircraft plants.

★ ★ ★

Oakite Rustripper, the manufacturers state, is a heavy-duty, off-white powder that may be used in hot or cold solutions. It may also be used with direct current to remove deep-pitted rust, or reverse current to remove heat scale. Among the advantages claimed for this material are (1) It will not attack sound metal; (2) It will not cause hydrogen embrittlement; (3) It does not require

International Wire Products Corp.

Midland Park, N. J.

Fabricators of copper, stainless, monel, and steel strands and cables in the fine sizes.

We invite special constructions for experimental cables and strands —for use in Engineering Department work.

We specialize in strands and wire for the costume jewelry trades— Gold colors and silver color strands and wires.

Our facilities include wire drawing, tinning and stranding of single end and multiple wires.

Strand annealing furnace for monel, stainless and silver plate wires —including phosphor bronze and brass from .040 to .002 fine sizes.

HAVING TROUBLE WITH LIGHT WEIGHT REELS FAILING IN HEAVY DUTY SERVICE?

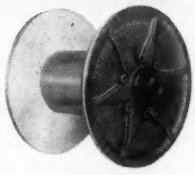
MILTON MACHINE offers you

A SOLUTION TO YOUR PROBLEM that'll save on replacement and maintenance!

RUGGED STEEL HEAVY DUTY PROCESSING REELS

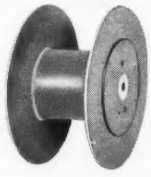
HEAVY DUTY REEL

Designed for the heavy duty service of a wire rope manufacturer. Flanges with rope brake rim grooves are heavily ribbed semi-steel castings.



WELDED STEEL REEL

Made to wire rope mill's specification to replace light weight pressed steel reels that failed in heavy duty service.



SOLID STEEL PROCESSING SPOOLS & BOBBINS

WRITE FOR BULLETIN 52-W

Your inquiries are invited . . . write or phone, our field engineer-representative will be glad to describe our facilities.

MILTON MACHINE WORKS, Inc.
DESIGNERS – ENGINEERS – MANUFACTURERS
MILTON • PENNA.

special equipment, such as stainless steel tanks; (4) It assures safety of regular equipment; (5) It creates no troublesome fumes; (6) It may be disposed of in the same manner as any highly alkaline solution; (7) It strips certain types of paint at the same time as it removes rust; and (8) It protects against rerusting.

★ ★ ★

Further information on this new alkaline descaler will be sent to readers writing on company letterhead to Oakite Products, Inc., 152A Rector St., New York 6, N. Y.

New Folder Describes Bunching Stranding Machine

The Haskell-Dawes Machine Co., Inc., 2231 East Ontario St., Philadelphia 34, Pa. has issued a new technical bulletin describing their 12 x 12—12 x 22 Buncher-Strander.

★ ★ ★

This is a basic 12 x 14 buncher engineered to produce the highest uniformity and quality of bunched wires. When equipped with the 7-wire revolving supply, it will produce from 2 to 7 strand constructions using bunched, P.V.C. or braid covered wires.

★ ★ ★

Can turn out 6000 feet per hour with a one inch pitch of lay. Production rates vary inversely as the pitch of lay. Flyer speed is 1200 RPM for the 12 x 14 reel and 1000 RPM for the 12 x 22 reel. Range of lay form 0.25 to 3.00 inches possible through gear changes.

★ ★ ★

Full details, with illustrations and diagrams will be found in the bulletin, which will be sent to executives or engineers upon request.

New Bulletin Describes 12-Head Buncher-Twister

A new six page bulletin has been issued by **Haskell-Dawes Machine** Co., 2231 E. Ontario St., Philadelphia 34, Pa., illustrating and describing their 12-head-bunching-twisting machine designed for small sizes of bunched and twisted wire like Litz wire, fourdrinier

STANNOUS SULFATE

Saves Tin!

in liquor finishing operations

because

M & T Stannous Sulfate — a manufactured chemical — saves tin by doing away with many of the inefficiencies which accompany the treating of feather or flake tin to produce stannous sulfate on the job.

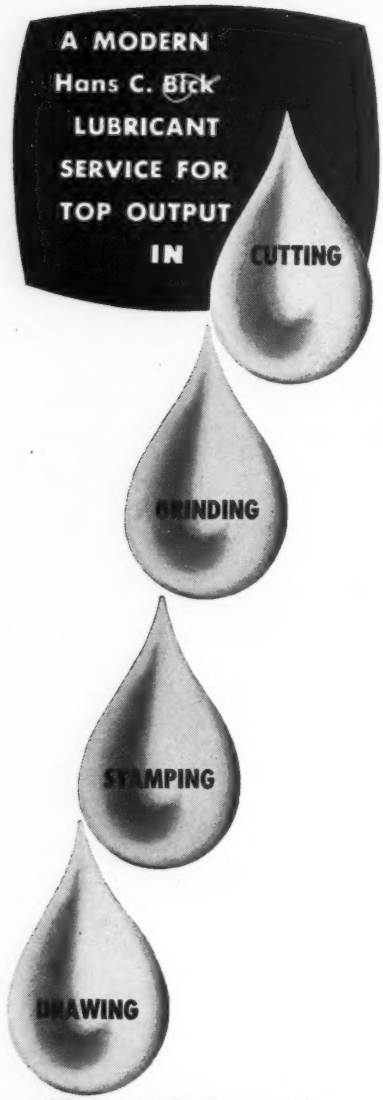
More convenient to use, too!

Baths are operable as soon as materials are dissolved. Solutions can be prepared in advance to produce desired colors and coating thicknesses.

AND, additions are made from stock solutions, assuring quick, complete mixing—eliminating any possibility of materials only partially dissolving in the bath—reducing the chances of miscalculating quantities of materials added.

Use M & T Stannous Sulfate for white or straw-color finishes. Write for technical procedure sheet.

METAL & THERMIT CORPORATION
Chemical Division
100 E. 42nd St., New York 17, N. Y.
Specialists in Tin and Tin Chemicals



• The top production rates designed into your machines are yours to profit by when you call upon Hans C. Bick for modern lubricants, coolants, and cutting fluids. Manufactured by specialists with 23 years' experience, these compounds are engineered for rigorous conditions such as high feeds, speeds and pressures. Furthermore, you'll like the friendly manner in which our engineers cooperate to solve the toughest problems. To get the most from your machines and tools, always call upon Hans C. Bick to smooth and cool the way.

Hans C. Bick, INC.

READING, PENNSYLVANIA

wire, tinsel resistance coils, etc.

★ ★ ★

High production is obtained from the 2000 RPM speed of the twisting heads, which are all driven from one master gear. Precision construction and design produce an unvarying lay of work.

★ ★ ★

While the bulletin gives specifications, every 12-head twister is custom engineered to the customers' requirements. Hence specifications may vary from those given.

★ ★ ★

A copy of the bulletin will be sent to engineers and executives upon request.

Executive Says Industry Lags In Modernizing

About $60 billions' worth of capital equipment in U. S. industry is more than 10 years old and within two decades the figure will climb to $200 billion, according to the head of the nation's largest industrial financing firm.

★ ★ ★

These figures, said **S. D. Maddock,** president of **C. I. T. Corporation,** indicate a steadily rising demand for machinery and equipment to replace and supplement industry's capital equipment.

★ ★ ★

Mr. Maddock said a study by the Machinery and Allied Products Institute showed current replacement expenditures in industry are $10.4 billion annually. This figure, the study showed, will increase to $15 billion by 1960 and to $26.7 billion by 1975.

★ ★ ★

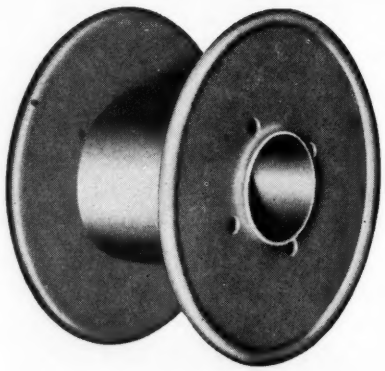
Expenditures for replacement of old equipment would exceed these estimates impressively, if industry weeded out all the obsolete and outworn machinery being used.

★ ★ ★

Much of the lag in modernizing capital equipment, Maddock pointed out, is caused by a failure to understand that income-producing machinery can now be purchased on terms which permit it to pay for itself.

Best for today's

HIGH SPEEDS



Industry's tireless search for greater efficiency is constantly posing new problems in high speed for the wire industry. This has underscored, as never before, the need for correct design and careful construction of reels for wire drawing machines.

For over a half century, Apco Mossberg has produced reels of highest quality. Apco Mossberg High Speed Reels are manufactured to extremely close tolerances — with particular emphasis on trueness and balance.

Here's something else. It's standard practice at Apco Mossberg to give each and every inquiry about steel reels, spools or bobbins individual attention. Bring your next problem to Apco Mossberg. Without obligation, an Apco trained engineer will be glad to offer suggestions and solutions to your particular problems. Write for further details.

PACIFIC COAST REPRESENTATIVE
Gordon Proffitt
Matson Building
215 Market St.
San Francisco 5, Calif.

CANADIAN REPRESENTATIVE
Hugh P. Williams & Co.
47 Colborne Street, West
Toronto, Ontario, Canada

The original Frank Mossberg Company

APCO MOSSBERG COMPANY

ATTLEBORO, MASS.

British Wire Directory

The 1954 edition of "Wire Reference Year Book and Directory," published by Alfred Hinde, Ltd., Clarence Street Printing Works, Wolverhampton, England, published recently, contains much useful information.

★ ★ ★

Among the features is an American bibliography, one covering international wire literature, a section covering B.I.S.R.A. reports, and chapters devoted to brand names, British standards, a buyers' guide, a glossary of terms and various tables, specifications and other helpful data.

★ ★ ★

The American Bibliography contains the articles and subjects published in Wire and Wire Products from 1950 through 1952. The publishers hope to complete this through 1954 in their next issue.

Lubricant Manufacturer Adds Wire Man to Staff

The L. R. Kerns Co., 2657 E. 95th St., Chicago 17, Ill., manufacturers of industrial lubricants, which include a line of wire drawing compounds, has announced the addition to its staff of **A. A. Weigle.** Mr. Weigle has had many years of experience in the wire drawing industry and is well-known in wire circles, especially in the Midwest. He will devote his energies and experience to the sale of the company's line of Mor-Film wire drawing compounds.

New Packaging Methods Used by American Chain and Cable

Two new packaging techniques are now being used for the shipment of large-diameter Page welding wire, according to **W. H. Bleecker,** sales manager, **Page Steel and Wire Division, American Chain & Cable Company, Inc.,** Monessen, Pa.

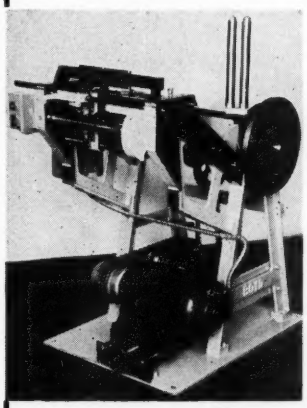
★ ★ ★

The 22-inch ID pallet-mounted coils, shown on next page are designed for quick handling with a fork-lift truck and are said to be

FOR HEAVY DUTY COILING

USE THE NEW BOYD #1200 HEAVY DUTY SPOOLER

Designed for the spooling or coiling of heavy materials on large diameter spools or in coils.



Positive screw reversing mechanism and change gears offer a wide range of distances and speeds for traverse rates to accommodate various sizes of wire or other materials.

Large adjustable slip clutch provides constant speed of winding to allow for build-up and to produce uniformity. This makes this machine an excellent addition to your drawing or finishing machine producing your product at a point where it is to be packaged.

Supplied with gear motor and starter, Hi-Lo pulley and motor base. Can also be had with predetermining counter and auto-stop motion.

Its versatility allows it to be easily suited to meet your particular requirements in spool or coil diameters and traverse widths.

Send for full particulars

BOYD & SONS MANUFACTURING CORPORATION

1434-38 Callowhill St. **Philadelphia 30, Pa.**

NEW BOOK ON STEEL WIRE

"The Manufacture and Properties of Steel Wire" is the title of a book by Anton Pomp, Dr. Eng., that has been translated from German into English by C. P. Bernhoeft, Dipl. Eng., and published by The Wire Industry, London, Eng. It contains 358 pages of text and sells for $11.80 per copy.

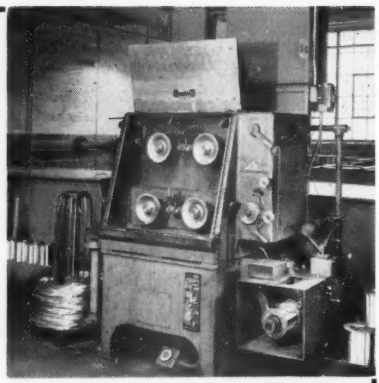
It is the most up-to-date treatise on steelwire manufacture available and covers the latest developments in wire processing, such as mechanical descaling, increased drawing speeds and lubricants for these high speeds, die shapes and modern testing procedures.
The entire range of wire manufacture, from rods to finished products are discussed.

Copies may be ordered through

WIRE AND WIRE PRODUCTS

453 Main Street ● **Stamford, Conn.**

"ALBANY"
WIRE DRAWING LUBRICANTS
FOR ALL TYPES OF FERROUS AND NON-FERROUS METALS
WET OR DRY DRAW



Typical Wet Machine for Drawing Operation

You can improve your wire quality and increase your drawing efficiency by

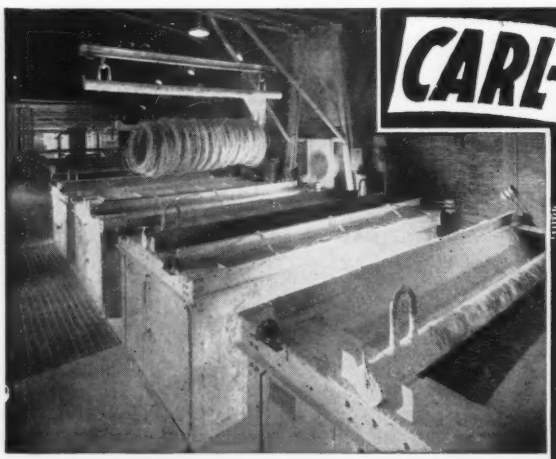
USING "ALBANY" PRODUCTS

Our Engineers are prepared to assist you.

1868 — ADAM COOK'S SONS, INC. — 1954

LINDEN • NEW JERSEY

OTHER ALBANY PRODUCTS ARE DESIGNED FOR TUBE DRAWING AND OTHER METAL WORKING OPERATIONS



CARL-MAYER

HI-SPEED REGISTERED

ROD BAKERS

PATENT Nos.
U.S.A. 2,296,361 2,323,828
CANADA 2,235,559 396,144 401,589

ALSO OTHER TYPES OF INDUSTRIAL OVENS AND FURNACES

GREATER SPEED AND FUEL ECONOMY PROVES OUTSTANDING ENGINEERING

Carl-Mayer Hi-Speed Rod Bakers have an exclusive heating arrangement, combining faster baking with amazing fuel economy—and a patented Blow-Off feature which removes moisture without bumping or agitating the coils. *WRITE FOR BULLETIN NO. 350.*

SERVING CONCERNS LIKE THESE:

American Steel & Wire Co.
Atlantic Wire Co.
Atlas Steel Co.
Atlas Tack Corp.
Babcock & Wilcox
Canadian Steel Corporation.
California Wire Cloth Corp.
Colorado Fuel & Iron Corp.
Crucible Steel Co. of America
Eaton Manufacturing Co.
Frost Steel & Wire Co., Ltd.
B. Greening Wire Co., Ltd.
Gary Screw & Bolt Division of Pittsburgh Screw & Bolt Corp.
Hollup Corp.
Indiana Steel & Wire Co.
Johnson & Nephew, Ltd.
Jones & Laughlin Steel Corp.
Page Steel & Wire Co.
Pittsburgh Tool Steel Wire Co.
Republic Steel Corp.
Steel Co. of Canada

THE CARL-MAYER CORPORATION

3030 EUCLID AVENUE
CLEVELAND, OHIO

easy to spot when stored. They are protected during shipment and storage by steel straps and paper wrapping.

★ ★ ★

For coils up to 16 inches ID, the company has adopted Leverpaks. A strong, lightweight container, they are sealed airtight and packed

with a moisture-absorbing material to reduce corrosion. These containers are available at no extra cost to customers and can be reused many times.

★ ★ ★

Page automatic welding wires will continue to be supplied on 25-pound non-returnable reels to fit popular arc welding machines.

New Check List on Metal Chemicals Available

American Chemical Paint Company, Ambler, Pa., has issued a new "Check List" on their chemicals and processes for protecting and preparing surfaces for paint bonding. The metals covered are aluminum, brass, copper and copper alloys, galvanized iron, zinc and cadmium, iron and steel, magnesium and stainless steel.

★ ★ ★

This highly useful bulletin will be sent by the company upon request.

Wire Man Joins Yarn Concern

Sam Caidin, formerly Purchasing Agent at **Miller Electric Company,** Pawtucket, R. I., and more recently doing Sales promotional work for **Cable Electric Company** has been appointed Sales Manager of **Chemo-Textiles Inc.,** West Warwick, R. I., supplier of Teflon, Silicone and Plastic coated glass yarns, managed by **George F. Clark** a former Miller Electric Company development man.

Opportunity in Kansas for Electric Wire Concerns

Growth of the aircraft, construction and electrical appliance industries in Kansas in recent years has created a demand for additional Kansas manufacturers of insulated wire and cable. That's the finding of Midwest Research Institute in a six-month study conducted for the Kansas Industrial Development Commission, 1025 Kansas Ave., Topeka, Kan.

★ ★ ★

The report says that during 1953 the Kansas market for insulated wire and cable amounted to 17 million dollars while Kansas production was less than two million dollars.

★ ★ ★

The Midwest report suggests that this 15 million dollar production deficiency in Kansas, plus the Kansas area's central location and excellent transportation facilities, make the Sunflower state desirable for insulated wire and cable manufacturers seeking plant locations.

Westinghouse Opens Alabama Electrode Plant

Modern production techniques, latest quality control methods, good plant layout, and a high degree of self-sufficiency characterize the new **Westinghouse Electric Corporation** plant in Montevallo, Alabama for the manufacture of welding electrodes and brazing rods. This modern single-story plant, located on a 54-acre site 35 miles south of Birmingham, will consume over two million pounds of hot-rolled wire per month in the manufacture of welding electrodes.

★ ★ ★

Part of the current Westinghouse 296-million-dollar expansion program, the Montevallo plant was built to meet the growing market for electrodes and brazing rods in the South. It is the first electrode plant in the South. Approximately 100 persons will be employed at Montevallo when the plant is at full production with a total annual payroll of about one half million dollars. All labor, with the exception of some supervisory personnel,

VINYLS for...

CRITICAL CUSTOMERS

For the past ten years we have specialized in the compounding of Vinyl extrusion and injection molding compounds to specifications, or developing compounds for a specific use.

Underwriters' approved standard compounds are available in all colors for POT, T, TW, 80 Degree C, 90 Degree C and 105 Degree C wires.

If you require a Vinyl compound rated higher than 105 degrees C for special applications, we suggest you communicate with us, as we may have a compound to meet your requirements.

Your inquiries are invited.

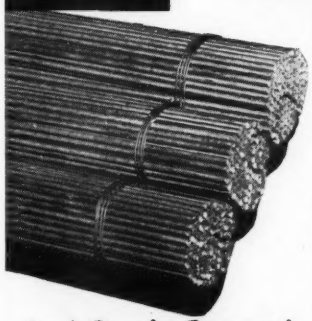
ELECTRONIC RUBBER COMPANY

69 Sunnyside Ave. • Stamford, Conn.

CF&I

STRAIGHTENED AND CUT WIRE

meets any specification...



When you buy CF&I Straightened and Cut Wire, you can be sure it will meet your specifications—finish, temper, gauge and length. That's because skilled metallurgists and craftsmen team together to carefully control all phases of production—from ore to finished product.

Contact your nearest CF&I representative for full details on how CF&I Straightened and Cut Wire can best serve your needs.

And Don't Forget!

There is also a complete range of CF&I Wire Rods and Basic Wires to fill any of your other requirements.

The Colorado Fuel And Iron Corporation
Denver, Colorado
Please send data on CF&I Straightened and Cut Wire.

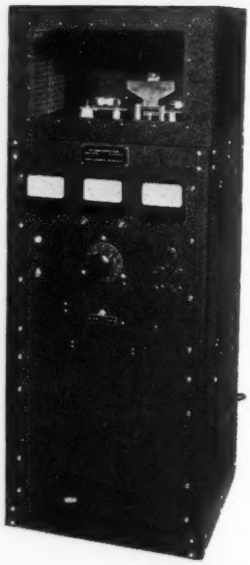
Name _____
Address _____
_____
Use General Specifications
_____

CF&I STRAIGHTENED & CUT WIRE
THE COLORADO FUEL AND IRON CORPORATION CF&I

Albuquerque • Amarillo • Billings • Boise • Butte • Denver • El Paso • Ft. Worth • Houston • Lincoln (Neb.)
Los Angeles • Oakland • Oklahoma City • Phoenix • Portland • Pueblo • Salt Lake City • San Francisco
Seattle • Spokane • Wichita • *CANADIAN REPRESENTATIVES AT* • Calgary • Edmonton • Vancouver

2493

AC/DC HIGH POTENTIAL TEST SETS



- High sensitivity circuit breaker, continuously adjustable.
- Non-destructive testing.
- Continuously adjustable output voltage, AC or DC.
- Voltmeters across output.
- Complete series—up to 100 KV units.
- Optional burn feature.

OTHER PRODUCTS:
Continuous Insulation Testers for Magnet Wires.
SPARK TESTERS
SENSITIVE HIPOT TESTERS

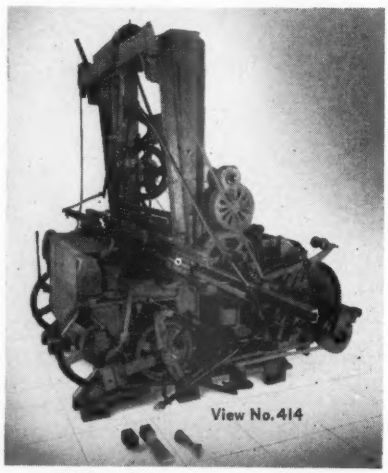
Write for bulletin

PESCHEL ELECTRONICS, INC.
13 Garden Street Tel: NE 6-3342 New Rochelle, N. Y.

MEDIUM HEAVY WIRE LOOMS
No. 1548 MADE IN 48″ AND 60″ WIDTHS

Performs a wide range of weaving: from 1 to 60 meshes per inch, with gear let-off; 12 to 100 meshes or finer with ratchet let-off. Capacity is 6 mesh, .063″ wire, or equivalent lathe beat-up resistances. Has cast iron warp drum, with steel spacing rings 2″ center to center, ¼″ thick, with a warp drum winding attachment.

This loom has been redesigned and improved to provide better tension control. An electric automatic stop is furnished for when wire breakages occur. The looms are medium in weight. Approximately 16,000 lbs. for the 48″ width and 18,000 lbs. for 60″ widths. They are well-made, strong and rugged.



Medium Heavy Loom No. 1548

Write for descriptive literature on this or other type looms you may need.

MUMMERT-DIXON CO.
HANOVER 3, PENNSYLVANIA

is being hired from the immediate area.

★ ★ ★

The plant has essentially three lines: one for welding electrodes an adjacent line for compounding flux coatings, and a line for the manufacture of Phos-copper® and Phos-silver® brazing rods. The welding electrode line forms a tight oval with part of the facilities overhead. The flux compounding line adjoins the electrode line and consists of weighing and mixing facilities. The brazing rod line, which requires much less space, is located at one end of the plant.

Western Electric Moves Harper to Coast

The Western Electric Company has announced that **Paul F. Harper,** formerly of its Radio Division, is being transferred to Hollywood where he will act as the Company's West Coast representative in matters relating to Patent Licensing.

★ ★ ★

After graduating from the University of California in 1923, Mr. Harper began his Bell System career as an electrical engineer with the Pacific Telephone and Telegraph Company. In 1930 he transferred to the Electrical Research Products Division of Western Electric where he served in various capacities, including two years as Merchandise Manager prior to coming East in 1950.

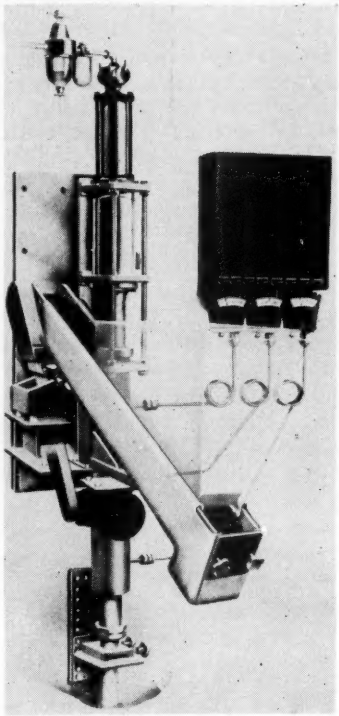
★ ★ ★

During World War II Mr. Harper served with the U. S. Army Ordnance Corps as Supply Officer at Benecia Arsenal, California, and retains a Colonel's commission in the reserve.

New Ram Operated "Teflon" Rod and Tube Extruder

A new, ram operated "Teflon" rod and tube extruder that offers users reliable, continuous production and is simple and easy to operate has recently been developed by **Jennings Engineering, Inc.,** 3452 Ludlow Street, Philadelphia 4, Pa. The unit, called the TRE-1 Extruder, is completely automatic

and produces rod in sizes from ¼" o. d. up to and including 2½" o. d. and tubing from 1" i. d. up to and including 2" i. d. The new Jennings extruder meters cold "Teflon" powder to a die chamber where it is compressed by a reciprocating, pneumatically - operated ram. The powder is then sintered, partially cooled and extruder as a continuous, solid rod or tube of "Teflon", depending upon the die used. The metering conveyor and ram can be selectively timed and controlled to meet particular product requirements. There are only 5 basic components: the pneumatic system, air cylinder, ram, die and feeding device. The unit bolts on to the wall and uses only a minimum amount of space in a plant.



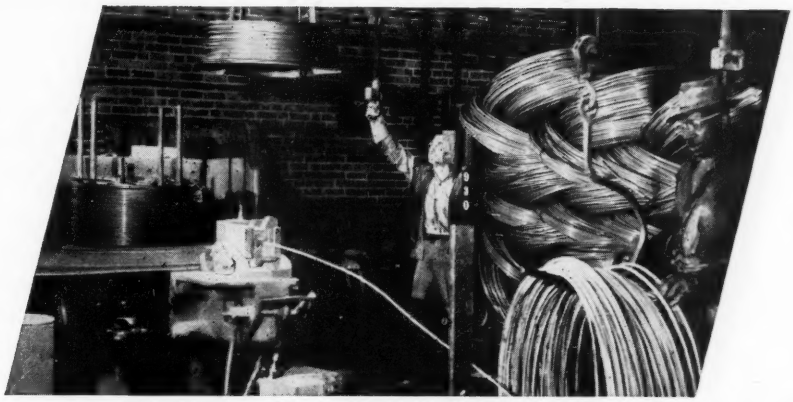
★ ★ ★

For additional details, write Jennings Engineering, Inc., 3452 Ludlow Street, Philadelphia 4, Pa.

ASTM Specifications for Steel Piping Materials

The 1954 edition of this compilation sponsored by ASTM Committee A-1 on Steel contains in their latest approved form the 53

SPARES THE ROD !



Gold Bond High Calcium Quicklime has the purity and uniformity of size and composition that assures highest coverage of your rod surface area. Lubricants adhere better over Gold Bond Quicklime coating, sticking more tightly and covering greater rod surface area, with less chance of damage to your finished product. Gold Bond High Calcium Quicklime helps reduce wear on drawing dies. And, because of this high quality, you actually can use over a *third less lime* as an adhering agent for your lubricant! See the difference Gold Bond High Calcium Quicklime can make. Consult your Gold Bond Representative for complete technical data.

Gold Bond
INDUSTRIAL PRODUCTS

NATIONAL GYPSUM COMPANY • BUFFALO 2, N. Y.

ARE YOU A MEMBER OF . . .
THE WIRE ASSOCIATION?

With the Silver Anniversary Annual Convention of the Association approaching—that you should attend—it is a good time to decide to join and participate in the activities of our society.

All Wire Men Should Belong

If you are engaged in the manufacture of rods, wire, wire products or electric wire and cable, you will find many benefits accruing to you personally through membership.

A booklet describing the Association, its activities and services will be sent to you on request.

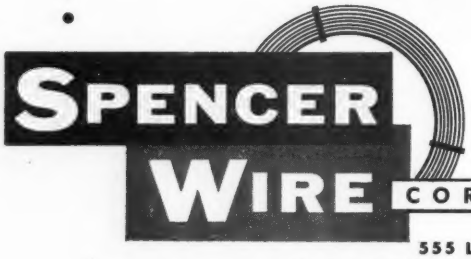
Write to

RICHARD E. BROWN, Executive Secretary

THE WIRE ASSOCIATION

453 Main Street • **Stamford, Conn.**

HIGH QUALITY
COPPER and BRONZE WIRE
Short Lay, Bunched and Concentric Strand



555 LEHIGH AVENUE • UNION, N. J.
Plants at UNION, N. J. • Telephone: UNionville 2-7950

KAY & WARREN CO.
33 BOX ST., BROOKLYN 22, N. Y.
Telephones: EVergreen 3-5514 & 3-5560

RECLAIMERS
of
INDUSTRIAL DIAMOND POWDERS
FROM USED WHEELS • HONES • SLUDGES
• COTTON WIPINGS • WIRE DIE POWDERS

ALL POWDERS CLEANED, ASSAYED AND GRADED TO MICRON SIZES.

Write or call for additional information

widely used ASTM specifications for carbon-steel and alloy-steel pipe and tubing, including stainless.

★ ★ ★

Materials covered include: pipe used to convey liquids, vapors, and gases at normal and elevated temperatures; boiler, superheater, and miscellaneous tubes; still tubes for refinery service; heat-exchanger and condenser tubes. To make the volume more complete there are also included specifications for the following materials used in pipe and related installations: castings; forgings and welding fittings; bolts and nuts. The ASTM standard classification of austenite grain size in steels (E 19) with two sets of charts; also the American Standards covering wrought steel and wrought iron pipe (B 36.10) and stainless steel pipe (B 36.19) are a part of the book.

★ ★ ★

In this special compilation 22 of the specifications included in the previous edition have been revised, of this number 17 are tentatives and 5 are standards. A new specification covers ferritic alloy steel forged and bored pipe for high-temperature service.

★ ★ ★

Ten Emergency Alternate Provisions applying to specifications in this compilation are printed in the pink section at the back of the book. (These are issued by the American Society for Testing Materials in accordance with a special procedure in the interest of expediting procurement or conservation of materials during the period of National Emergency.)

★ ★ ★

Committee A-1 comprising prominent authorities representing consumers, producers, and general interests, has sponsored nine previous editions of this volume, the last being in 1952.

★ ★ ★

Copies of this 370-page publication, heavy paper cover, can be obtained from Headquarters of the American Society for Testing Materials, 1916 Race Street, Philadelphia 3, Pa., at $3.75 each.

New Adhesive for Insulating Tapes

A new type of adhesive for bonding electrical insulating tapes contains Bakelite vinyl resins that resist varnish solvents to prevent tape loosening. The new adhesive is specially formulated for bonding glass mica, varnished cambric, and other varnish-saturated tapes used for insulating coils. Due to Bakelite vinyl resin's resistance to petroleum and coal-tar solvents, tape bonded with the new adhesive is not loosened or affected by dipping in varnish. When the varnish is baked on, the adhesive bond is hardened and strengthened by the heat, according to the manufacturer. Supplied in a collapsible tube, the adhesive can be quickly and neatly applied on tape ends to hold the firmly wound insulation in place. Tubes containing approximately one or two ounces of adhesive are available. For large-scale application such as bonding felt to a steel or plastic mold, the adhesive is furnished in pint, quart, gallon and 5-gallon cans, in a slightly lower consistency. The excellent electrical resistivity of Bakelite vinyl resins and their resistance to moisture and most chemicals is particularly useful for electrical bonding applications.

★ ★ ★

The adhesive is based on Bakelite vinyl resins, Sterling T-723 Adhesive is manufactured by **The Sterling Varnish Company,** Haysville Borough, Sewickley, Pa.

Some Aspects of the Hardenability of Steels

Bulletin A-63 has 12 pages documented with charts and photomicrographs. The selection of steels solely on the basis of the usual hardenability tests may be an inadequate procedure especially where optimum performance qualities are essential or desired. Steels with the same end-quench hardness curves or hardenability are shown to have much different toughness as measured by notch bar tests at equal hardness and strength levels. For your copy, write to **International Nickel,** New York 5, N. Y.

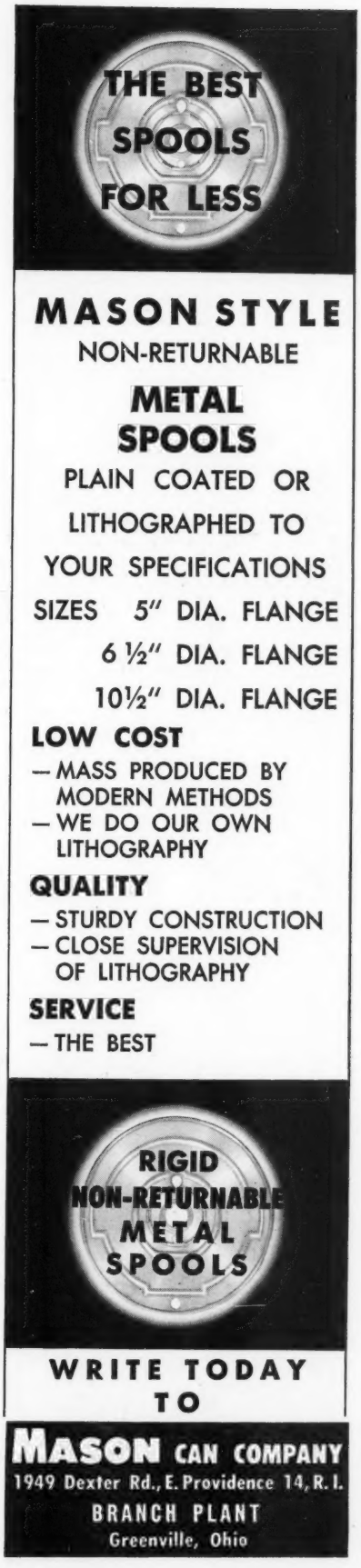
Status of Polymonochlorotrifluoroethylene Insulated Wire

(*Continued from page* 993)

The Rex Corporation, in September 1953, announced the availability for the first time of striped Kel-F wire. This is a significant step in the direction of wider use of Kel-F insulated wire, particularly in cables; with solid colors alone, only some fifteen codes are available. Furthermore, striping permits the use of coding systems presently well established for vinyl and other wires. The inks give clear, uniform and well defined stripes, which are resistant to normal abrasion. We have found that adhesion of the stripes is improved after heat aging. Aromatic hydrocarbons, ketones, and mineral acids will obliterate the present inks, thus confining usage to solid colors where these reagents are present. As might be expected, the reaction to a new product, such as this, has been inconclusive. However, as users become more familiar with the material, we are convinced that striped Kel-F will receive general acceptance. As a result of this development, the Kellogg Company has decided to supply the industry with white as well as clear extrusion granules.

Control Methods

Recently, the Kellogg laboratories have developed a procedure called the ZST Test or Zero Time Test, which is a modification of their NST Test. A standard test strip is used; however, the temperature at which the test is conducted is fixed, and the time required for the test strip to pull apart at the notch is measured in seconds. By referring to an appropriate curve or chart, the ZST or the relative molecular weight equivalent can be determined. This test not only has reduced the elapsed time required for determining NST or molecular weight, but by using simple, automatic



WHAT HAPPENS TO LOOSE ENDS?

Some people believe in tying up the loose ends. We believe there's an easier way of eliminating them.

Loose, frayed ends on glass-braided wire that has been stripped and tinned are a real problem. They look messy. They get in the way. And the increased diameter of the wire defeats the engineer's efforts to make room for the greatest possible number of wires.

Our laboratory's contribution to the solution of this problem was to develop a NELCO saturant that does a slick job of controlling and keeping flat those frayed ends of glass braid. This is the saturant's primary job but it has some other very fine qualities.

First of all, it operates as a barrier coat between the primary insulation and subsequent lacquering. This results in much higher insulation resistance.

Secondly, it resists discoloration due to ultra-violet exposure.

Thirdly and importantly, this NELCO saturant in no way adds any flammability to the finished wire.

And finally, the saturant is easily applied either in a lacquering tower or during the braiding operation.

Instead of worrying, wondering what to do about those loose, frayed ends on your glass-braided wire, turn the problem over to us and we'll show you how to make every strand lie down in its proper place.

NEW ENGLAND LACQUER CO.

150 King Philip Rd., East Providence, R. I.

timing devices, has decreased the man-hours needed to run the test. There is some indication that greater precision is obtained over the NST method. The method has been found very satisfactory for testing molded Kel-F. Further work, now in progress, will be needed before it can be determined whether the method can be applied to wire insulation. Should the test be found as accurate for wire as for molded Kel-F, a substantial contribution will have been made in control methods.

Present and Future Wire Applications

At the present time, hook-up wire is the main product that is insulated with Kel-F. However, multi-conductor cables jacketed with plasticized and unplasticized polymer are beginning to be used for airplane applications. It is expected that this product will be employed for control and low voltage cables where high temperature resistance, corrosive fumes and chemicals are present. There is reason to expect that underwater applications will develop, where the outstanding moisture resistance of the resin will serve as a deciding factor. Given far lower prices, it is not unreasonable to expect that Kel-F will supplant impregnated asbestos in applications such as fluorescent fixtures. As with any new polymer, prices are expected to drop as usage increases and production expands. The Kellogg Company has announced that it is now producing material in its new plant; we hope that this plant will produce materials in much larger quantities. Lower price, we are informed, will be dependent on the various factors encountered when the plant is in full operation, and they are in a position properly to estimate the cost.

★ ★ ★

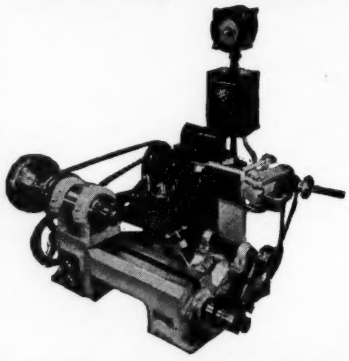
Improvements in the quality of the striping inks can be expected, and there is hope that air drying inks may be produced. Also, the inks are expected to approach the chemical inertness of the basic Kel-F resin.

★ ★ ★

CUT Die Room COSTS 50% with the New type "M"

DYKREX
"IT CORRECTS THE DIE"

automatic Polishing Machine



Double your finished Tungsten Carbide Die production

•

Save ½ labor costs—

•

The new automatic polisher with the Time Switch—

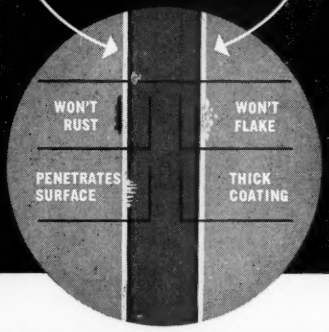
•

It is completely assembled—just plug it in!

ROOS TOOL & MFG. DIVISION
Dykrex Corporation of America
manufacturers of
Wire Die Finishing Machinery
33 Bloomfield Avenue
Newark 4, N. J.
Western Union
Teletype Service
QAB-WUX—Montclair, N. J.
The Standard of the Wire Industry

Here's why you should coat high and low carbon steel rod with

BORAX 5 MOL.



No Dust... For a cleaner shop—pleasant working conditions and easier house keeping. Borax-coated rod does not dust or flake, can be held in storage longer and is pleasanter to handle.

No Baking... The Borax solution penetrates the porous surface of the metal, neutralizing deepseated acid, and eliminating the need for baking.

Longer Storage... The continuous film of Borax inhibits the formation of rust for a considerable period—particularly important where several days may elapse between coating and drawing.

Economical... A single dip in the Borax bath provides a thick durable coating which is very valuable where the wire is to be drawn in several stages.

Write to our Technical Department for further information.

PACIFIC COAST BORAX CO.
DIVISION OF BORAX CONSOLIDATED, LIMITED
NEW YORK • CHICAGO
LOS ANGELES • CLEVELAND
PHILADELPHIA

MANUFACTURERS OF FAMOUS "20 MULE TEAM" PACKAGE PRODUCTS

Rex type KF is potentially a 200°C wire. However, present techniques have not realized the maximum properties inherent in the polymer itself; hence, the top temperature to be recommended at the present time for continuous use is 150°C. It is expected that the combined efforts of wire insulators, material manufacturers, and the Signal Corps will produce insulated wire for continuous operation at 175°C to 195°C.

★ ★ ★

Note: Since presentation of this paper, resin prices have been lowered by approximately, 25%.

Aspects and Advantages of Training In the Wire Industry

(*Continued from page* 991)

to change their methods, it is better for them to work out their allotted span in their own way and in their own time. Do not harass an old and trusted servant who is a worthwhile member of the works community.

★ ★ ★

Now we come to the second point mentioned—that of determining the best method of doing the job and, as the two subjects are closely related, it is proposed to refer also to the means by which one might ensure the ready acceptance of changes in method. The task of determining the best method of working is always performed in one of two circumstances —either where existing machinery is already in operation, or where new type machinery is being brought into use. The solution to the problem of how best to improve methods on existing plant or discover the most efficient methods of operating new plant is to be found in the application of "work study." Whilst the author is not an authority on the application of this skill in its many details, he has gained some experience in applying a form of work study appropriate to the company's needs at the present time.

★ ★ ★

BUNCHING (TWISTING) AND STRANDING IN THE WIRE AND GENERAL MANUFACTURING PROCESSES

SPECIALIZED ENGINEERING AND SPECIALIZED FACILITIES AT YOUR SERVICE

Expanding application of twisting principles to the production of many products is reflected by an ever-increasing demand for both H-D standard equipment as well as machines especially engineered to solve varied production problems. Week after week surprising new uses are developed through the close cooperation of our engineering department with manufacturers in many fields.

Write today for our New Technical Bulletins. Tell us what you make—or contemplate making and your inquiry will receive prompt attention.

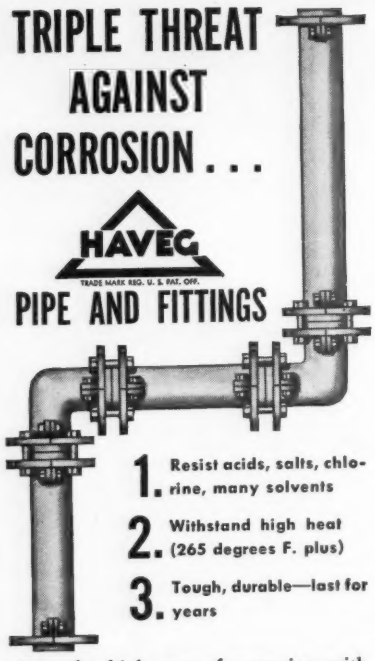
HASKELL-DAWES MACHINE CO., INC.
2231 E. ONTARIO ST.
PHILADELPHIA 34
PA.

TRIPLE THREAT AGAINST CORROSION . . .

HAVEG

TRADE MARK REG. U. S. PAT. OFF.

PIPE AND FITTINGS



1. Resist acids, salts, chlorine, many solvents
2. Withstand high heat (265 degrees F. plus)
3. Tough, durable—last for years

Beat the high cost of corrosion with proven, genuine Haveg pipe and fittings. Pipe highly corrosive fluids in temperatures as high as 265 degrees F. with a good margin of safety! Since Haveg is not a coating or lining, the possibility of contamination is eliminated.

Haveg is a moldable, thermosetting plastic made by mixing acid-digested asbestos with special resins. Haveg process equipment is unusually resistant to most acids, salts, chlorine, many solvents . . . and withstands extremely high thermal shock. Haveg is really a triple threat against corrosion!

Send for 64-page Bulletin F-6. It contains complete information on Haveg pipe, fittings, valves, pumps, cylindrical and rectangular tanks, heat exchangers, and other corrosion-resistant process equipment. Call your Haveg sales engineer for first-hand facts.

PUMPS TANKS PIPE

HAVEG CORPORATION

NEWARK 10, DELAWARE

TRADE MARK REG. U. S. PAT. OFF.

Factory: Wilmington 8, Del. • Wilmington 3-8884

ATLANTA	CHICAGO 11	CINCINNATI 37
Exchange 3821	Delaware 7-6088	Sycamore 2600
CLEVELAND 20		DETROIT 39
Washington 1-8700		Kenwood 1-1785
WESTFIELD, N.J.	HOUSTON 4	LOS ANGELES 14
Westfield 2-7383	Jackson 6840	Mutual 1105
SEATTLE 7		ST. LOUIS 17
Hemlock 1351		Mission 5-1223

A SUBSIDIARY OF CONTINENTAL-DIAMOND FIBRE CO.

Experience has shown that, in order to obtain the necessary data, study of action is required, and study of action can only be carried out whilst the job is in progress. Careful watching of the movements necessary to complete a cycle of operation is involved—watching not just one individual, but, where possible, several; analyzing the movements of each, not just for the sake of finding out who is the quickest worker, but rather to arrive at a method that ensures ease of working and flow of movement combined with neatness of operation. Those are the requirements for which one must aim, and speed of operation should only be developed from such a base.

★ ★ ★

When a system of working has been devised, it should be discussed with the supervisor and other responsible persons, corrected if necessary, and then tried in operation; the proof of the method will be found in its working. When satisfied that it is better in every way—then teach that method.

★ ★ ★

It is not always practicable to study other people's movements, in many instances the author has been the first person to operate new type machinery; but here again the same principle is involved—now it becomes analysis of one's own movements, proving the continuity of flow in action, feeling and knowing that the work is being carried out properly. That feeling gives confidence in teaching the method.

★ ★ ★

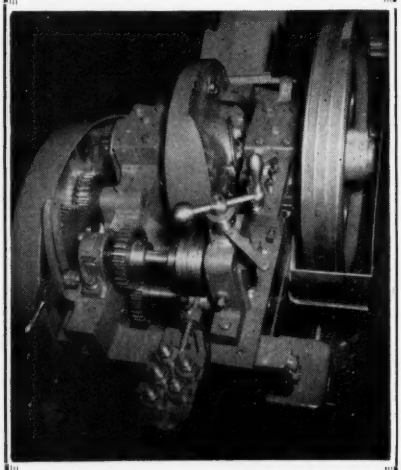
Now a word of warning—the approach to work study must be carefully undertaken. Many people have grown to distrust the motives of motion study, due to the misapplication of time and motion study in earlier days. This distrust has to be overcome and in order to do so it is necessary to make apparent to all that the results of work study are to be used fairly for the benefit of employer and employee alike.

★ ★ ★

1000 STAPLES PER MINUTE!!!

are made on the

HUMPHREY STAPLE MACHINE



Top View, showing Fly Wheel & Gears

MAKES: FENCE Staples
Poultry Netting Staples
Double Pointed Tacks

48 different leg lengths
Gauges 8 through 18

Efficient, Compact
Easily Adjustable

Models: Belt or Motor Drive

Prompt Deliveries

For further information write

SOLE DISTRIBUTORS

SEYBOLD TRANSWORLD EXPORTERS

122 East 42nd Street
New York 17 N. Y.
USA.

Cable Add: "SEBOLDEX-NEW YORK"

Obtaining the necessary information and implementing the method takes time, but it is not time wasted—the advantages considerably outweigh the disadvantages. What are these advantages? Effective production in less time; less scrap and waste; more efficient control of the machine; less waste time; a lessening of the possibilities of damage to the machine; an easier and better method of working; less risk of injury to the operative. These factors can only add up to one answer—more production of a better quality at less cost in less time.

★ ★ ★

It must be realized, however, that training, even of such limited capacity as that described, cannot be operated at a moment's notice. The schemes have to be formulated and instructors have to be trained. A firm which at the present time has no training scheme will indeed be fortunate if it is successfully operating one within a period of a few years. The sooner one starts with a training scheme, however, the sooner will it reach useful maturity.

★ ★ ★

With the introduction of training and educational schemes, it is necessary to arrange that upgrading or promotion to better jobs should be within the scope of every individual. In order to obtain promotion the individual must, of course, show ability and efficiency together with an educational standard equal to the requirements of the better job.

★ ★ ★

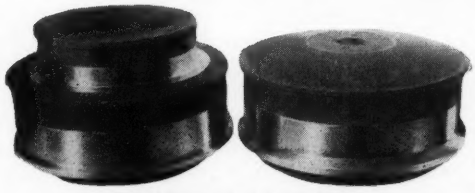
What is the position of the Trade Unions in all these schemes? They also are leaders in Industry, they too have the well-being of the individual to consider. On the subject of training there must be consultation and co-operation between leaders of management and labour, and on the necessity of training projects, one feels confident that the employer and the Trade Unions will maintain agreement.

★ ★ ★

Before concluding this paper let us consider one outstanding fact

CUT YOUR OPERATING COSTS
WITH HARDSURFACED:

Saves down time . . .
wire rejections . . .
increases production



VAUGHN HR BLOCKS

Hardsurfaced parts last
3 to 10 times as long as
standard equipment

DRAW BLOCKS
DRAW RINGS
CAPSTANS
PULL BLOCKS
SHEAVES
TABLE ROLLS
SHEAR BLADES
CRANE WHEELS
SHAFTING
and other
WEAR SURFACES

Write today for the facts

PARKWAY-KEW CORPORATION
P. O. Box 504 Menlo Park, N. J.
Telephone: MEtuchen 6-4747

CARBIDE NOZZLES . . .
FOR EXTRUDING COATINGS
Single and Multiple Conductor Wires
•
Let us tell you how to produce more wire before replacing nozzles.
•
Write for Data
WIRE TOOL DIVISION
BRIDGEPORT JIG BORING CO.
303 Stratford Ave. Bridgeport, Conn.

WE BUY WE SELL

We Pay Highest Prices for Used Machinery
4 SYNCRO MODEL BB-13
13-DIE WIRE DRAWING MACHINES
200 16-CARRIER WARDWELL BRAIDERS
All Machines Reconditioned in Our Own Shop
WIRE & TEXTILE MACHINERY INC.
P. O. BOX 436, PAWTUCKET, R. I.

METAL BOUND RETURNABLE REELS

Made in 12" to 24" diameters.

No nails used. *All glued construction.* Made of kiln-dried wood. Special design prevents breaking or splintering of wood, protecting insulated wire from damage.

Write for details

WILLIAM McCASKIE, INC.
FORGE ROAD • WESTPORT • MASS.
Tel.: 145 Est. 1903

FOR BETTER PRODUCTION

NATIONAL OFFERS YOU THREE SERVICES

- DIAMOND POWDER RECLAMATION — Exclusive process that gives maximum recovery. Send us your old cotton, die washings, worn wheels and sludge. High salvage percentages will pay you well.
- DIAMOND POWDERS—Complete line of graded quality powders for all lapping and finishing operations on wire drawing dies. First grades only.
- DIAMOND GRINDING WHEELS—A complete line of top-quality wheels for industrial production.

Write for prices.

NATIONAL RESEARCH COMPANY
25530 LITTLE MACK AVE.
ST. CLAIR SHORES, MICH.

which appears to be overlooked in many companies. Frequently managements go to great lengths in the selection and buying of raw material, in the preparation of material for processing and in the design of machines in order to improve productivity and quality standards. There is, unfortunately, a tendency to neglect the most vital factor of all — the Human element, without which the machines cannot run. Human beings require the same careful attention as that given to the material and the machine. The human element is, in fact, of more consequence than the machine; although the machine is necessary in attaining the required output, always remember, that it is the person in charge of the machine who produces the result.

★ ★ ★

Men who are correctly trained and have the appropriate plant and incentives, are well fitted to realize their ambitions, and in so doing will undoubtedly reach a high level of efficiency.

★ ★ ★

There are many other aspects of training which could be written about, including works visits, lectures on various subjects by qualified persons, etc., but in this paper the intention has been to keep to the simple and basic necessities for the introduction of new personnel, workshop training and technical training.

★ ★ ★

No doubt many people will be of the opinion that this paper is too idealistic. An ideal has certainly been propounded, but one that is practicable. Its practicability, however, can only be proved by each firm playing its part with others in introducng training programs and by promoting educational schemes which give a broader outlook than workshop training alone. Let us see all firms as one in outlook on this vital subject, instead of leaving the work to a few individuals and then criticizing them; the results may not be apparent in the lifetime of many of us but at least the instigators will have attempted something worthwhile.

HKP
PORTER
HANDKLIP
6C WIRE CUTTER

For FREE CUTTING of wires, cable, rods, boling wire and bolts up to medium hardness.

One of the handiest, most useful cutters ever made. Parrot-beak jaw quickly locates material for easy cutting. Protruding tip of jaw prevents wire from slipping, aids in stretching wire and is great for pulling out staples.

Essential equipment for cutting high tensile communication and power wires used in rural electrification (Model 6B with special hard cutting edges). See your supplier.

H. K. PORTER, INC.
Somerville 43, Mass.
Porter Cutters Porter Pruners
PORTER-FERGUSON Autobody and Fender Repair Tools

Get
MORE
Wire Mileage
with
HEANIUM®
Quality Guides

Highly resistant to wear.
Decreases down-time and replacement cost.

HEANY INDUSTRIAL CERAMIC CORP.
New Haven, Connecticut

DIAMOND POWDERS

New and Reclaimed

For the finest quality, accurately graded diamond powders—specify DANFORTH.

They will cost more than "bargain basement" powders, but will finish your dies more economically.

RECLAIMING

We will take your waste and reclaim it for you, guaranteeing that it will be 99% or better pure. Also, it will be returned properly graded for further use.

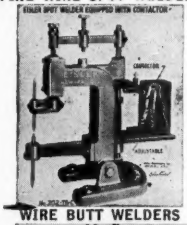
Get our prices and information on our processes.

C. W. DANFORTH CO.
Established in 1912
P.O. Box 448, Youngstown, O.

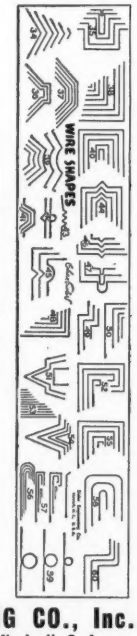
For FINE WIRES from .001" to 1/16"

High Speed Wire Cutters and Benders. Wire Spot Welders and Wire Butt Welders. Ask for test samples. Established 1920.

FINE WIRE SPOT WELDERS



Indexing Turntables
Cam Milling Service



WIRE BUTT WELDERS

CUTTING & BENDING MACHINES

EISLER ENGINEERING CO., Inc.
747 So. 13th St., Newark 3, N. J., U. S. A.

Wire Flattening—An Appraisal of Today's Theory and Practice

(*Continued from page* 965)

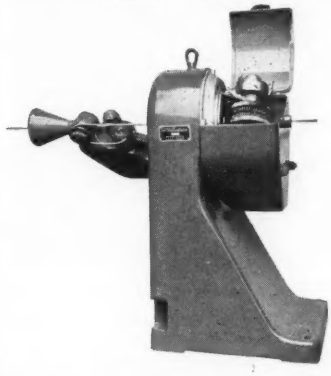
lustrated in Fig. 12, employ a combination of mechanical gauging contact and electrical magnification. Measurements are obtained by passing the strip between gauging rolls made of chromium-plated high carbon steel or of tungsten carbide. The thickness gauge is fitted with a special wire guide attachment comprising two adjustable guide rolls which maintain the wire in proper alignment with the gauging rolls. In measuring, the gauging rolls actuate a steel armature which is connected to four coils in the head of the gauge. Any movement of the armature unbalances both sides of an a.c. bridge circuit containing the four inductances. This movement is indicated in a greatly magnified form on a milliammeter calibrated in ten-thousandths of an inch. The thickness gauge meters usually have a scale range of ± 0.002 in. and the width gauge meters a range of ± 0.005 in. The gauges may be equipped with visible and audible indicating means to warn the mill operator whenever certain given size limits are exceeded.

★ ★ ★

In summary it may be said that today's high-speed flattening mill furnishes the metal-working industry with an important tool for the manufacture of precision stock having a high degree of surface finish, smooth edges and dimensions held to tolerances as close as ± 0.0001 in. With the enormous growth of the electronic and instrument industries, there exists a large demand for such close-tolerance, narrow-width stock in materials ranging from carbon and stainless steels to beryllium copper and the nickel alloys. The inherent accuracy of the modern wire flattening mill has enabled the wire producers to cater successfully to this valuable market.

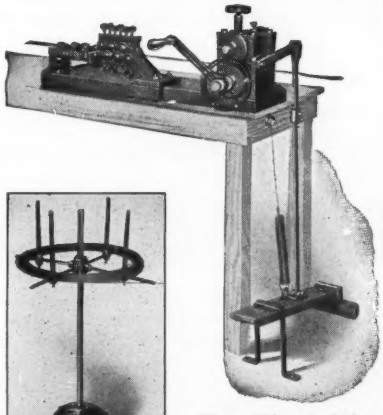
THE WIRE ASSOCIATION
invites wire men to join the organization and participate in its activities.
Write for a booklet on what it is and how it functions to
RICHARD E. BROWN
Executive Secretary
453 Main Street Stamford, Conn.

LINÉ-GORCY
MECHANICAL
WIRE ROD DESCALERS
(Patented in U.S.A.)



FISHER ASSOCIATES
SOLE AMERICAN DISTRIBUTORS
122 East 42nd Street
New York 17, N. Y.
Telephone: OXford 7-3294

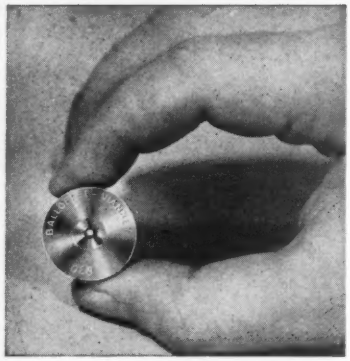
WIRE STRAIGHTENER



The Kilmer Wire straightening and cutting machine is hand operated and recommended for wire No. 8 to No. 19 gauge.
Wire Reel will handle coils up to 150 lbs. with I.D. adjustments from 7" to 22" and 30" O.D.

M. D. KILMER & COMPANY
4840 BROOKPARK RD.
CLEVELAND 9, OHIO

BALLOFFET VIANNEY WIRE DIE CO., Inc.



All sizes from .081" down to .0004" in stock from New York.

Manufacturers of
Quality diamond dies since 1870

BALLOFFET VIANNEY WIRE DIE CO., Inc.
6825 ADAMS ST., GUTTENBERG, N. J.
Tel: Union 3-3393

Johnson Steel and Wire Company Modernization Program

(*Continued from page 977*)

condition as it leaves the plant.

★ ★ ★

Johnson Steel and Wire was founded in 1926 by three brothers, whose family experience with wire production began a century ago in Sweden. They were **Charles D., Bernard A.** and **George G. Johnson.**

★ ★ ★

The Johnson brothers began drawing wire in a little wooden building with only one customer on their books. In the next quarter of a century they enlarged their plant to a total of 22 buildings with 250,000 square feet of floor space and established branches in Akron and Los Angeles. The company became a wholly-owned subsidiary of the Pittsburgh Steel Company in 1947.

★ ★ ★

WEMCO MOLTEN METAL PUMP

Air Driven
for
Rapid Transfer
of
ZINC
LEAD
ALUMINUM
TIN
THEIR ALLOYS
and
HEAT TREATING
SALTS

FISHER ASSOCIATES
SOLE DISTRIBUTORS
122 East 42nd St.
New York 17, N. Y.

Wire Rope Proving Its Value in "Big Top" Use

Wire rope is gradually replacing fiber and hemp in rigging The Greatest Show On Earth. Barnum & Bailey combined with Ringling Brothers are running constant tests to determine relative merits of wire and fiber rope in their many uses at the circus. Wire rope has been taking consistent lead in such essential qualities as safety, efficiency, ease of handling and longevity.

★ ★ ★

Most recent innovation from a safety standpoint is the replacement of supporting fiber rigging for trapezes with ⅜" improved plow steel wire rope slings with Dualoc safety endings. Trapezes are used by a chorus of sixty girls in a swing trapeze ballet right under the Big Top. The new wire rope slings replace hand spliced hangers. Dualoc safety ending is a product of **American Chain & Cable** and is available through distributors and company warehouses. As the name implies, it is double-locked for additional

Buy the Best: MONTGOMERY SILVER-COATED COPPER WIRE

Round for Kel-F & Teflon Insulated Radio and Instrument Hook-up Wire and UHF Cables.
Flat for Tinsel Ribbons and Tinsel Garlands.

Bare Electric Tinsel Conductors for Telephone-Razor-Hearing Aid Cords.

NEVA-TARN—Metallic Yarns—Non Tarnish—
for knitted and woven fabrics. Est. 1871

THE MONTGOMERY COMPANY
25 CANAL STREET Tel.: National 3-3338 WINDSOR LOCKS, CONN.

WOOD RETURNABLE PLYWOOD METAL BOUND NON-RETURNABLE

REELS

Prices on Request

Manufactured to Your Requirements

STRAND-BUFFALO CORP. NORTH TONAWANDA, N. Y.

strength, the wire ends permanently secured under steel collars. This type of fastener does not unbalance or destroy the rope structure like the tucks of a hand splice. A sidelight on this switch in equipment is that it was suggested by a salesman of American Chain & Cable who was selling this item for industrial use. Answer to a sales manager's prayer, he was attending the circus with his youngsters when he spotted the sale.

★ ★ ★

As a safety factor for performers, wire rope is nothing new to the circus. A type of cable aptly

Robert Reynolds, superintendent of properties, Ringling Brothers & Barnum and Bailey Circus, makes routine inspection of wire rope guy line before circus aerialists perform at New York's Madison Square Garden.

but coincidentally named "Hazard Wire Rope" has long been used. The original **Hazard Manufacturing Company** was established in 1868—three years before Barnum & Bailey came into existence. The story goes that the circus used to visit Wilkes-Barre, Pennsylvania, the home of Hazard, once a year and at this time the performers would come to the plant and stock up on wire rope for the year.

★ ★ ★

According to **Robert Reynolds,** veteran head of properties for Barnum & Bailey and Ringling Brothers, one of the greatest advantages of wire rope is that it will outlast hemp or fiber ten-fold. And unlike hemp, wire rope doesn't shrink when it rains. The

REELS • SPOOLS

ALL SIZES

WOOD - PLYWOOD - WOOD - METAL

RETURNABLE NON-RETURNABLE

Samples and Prices on Request

DURKEE MFG. CO. PINE RIVER, MINN.

MUSIC WIRE and SPECIAL WIRES

Music Wire for Industrial Purposes
211 sizes Bright Polished, .0015" to .3437"
45 sizes Bright Tinned, .003" to .125"
Aluminum—Annealed—Belt Lacing—Brass, Soft and Spring—Copper, Bare and Tinned
Coppered Steel Spring—Galvanized—Tinned
Monel—Nickel Silver—Pure Soft Nickel—Oil Tempered, Steel Spring, Black Finish
Phosphor Bronze, Spring Temper—Pure Iron Wire—Resistance Wire,
Hoskins Chromel "A"—Stainless, Soft and Spring Temper—Tag Wire, 1000
in an Envelope—Florist Wire—Spooled and Coiled, 1/4-1/2-1-5#
Wires Straightened and Cut to length—Small Gauges—Small orders our specialty
Wires and Strands for the fishermen. Trolling Wires, Copper-Monel-Stainless.
Leader Wires, "Wilstabrite" Stainless and "Silverbrite" Music.

THE MALIN & COMPANY

2514 Vestry Ave. Established in 1884 Cleveland 13, Ohio

WAYNE DIAMOND WIRE DRAWING DIES

Quality in Diamonds + Perfection

in Workmanship = Good Wire.

Satisfactory DIAMOND DIES can only be made by those who have experience, skill and knowledge. WAYNE has all of these. Users have called WAYNE DIES "the best."

WAYNE WIRE DIE CO., 200 Pennsylvania Ave., Hillside, N. J. Telephone: Elizabeth 2-2456

TUNGSTEN CARBIDE WIRE DRAWING DIES

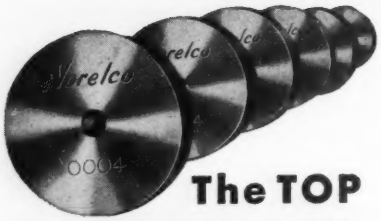
DESIGNED FOR LONG LIFE AND MAXIMUM WIRE PRODUCTION

Furnished semi-finished to within .001" to .002" of finished size at rough-drilled die prices. Require only light sizing and polishing before using. Our dies embody special design features that make for superior performance.

Also, a full line of carbide tooling for the Cold Heading Industry

EASTERN CARBIDE CORPORATION

NEW ROCHELLE, N. Y.



The TOP DIAMOND DIES are made by PHILIPS

For your most exacting wire drawing requirements, standardize on NORELCO Diamond Dies, made by the master craftsmen of PHILIPS in the world's largest, most modern diamond die factory.

Only the very best South African and Brazilian diamonds are used. Each consists of one closed crystal. Less than .4% of all the diamonds mined meet PHILIPS high quality requirements for purity, structure and shape.

These diamonds are drilled to precision tolerances, varying in proportion to the diameter, normally 0.3 to 3.5 microns. Closer tolerances can be supplied, if required.

Let us quote on your diamond die requirements.

North American Philips Company, Inc.
Elmet Division, Lewiston, Maine

Norelco

Note below the highly polished precision shaped drawing channel of this die for drawing copper which gives a burnished finish to the wire and long life to the die.

Big Top weighs 21 tons—three times this when wet—it contains 38,560 yards of canvas. Fiber riggings shrink during rain, then stretch out so that they have to be readjusted. Even during clear weather, fiber ropes will "guy out" and have to be adjusted two or three times daily. Use of wire rope in rigging the Big Top is thus a labor saving factor too.

★ ★ ★

Current use of wire rope under test is in reinforcing the seams of tents. Here again, its smaller circumference has proved advantageous. It permits snaps to be used to fasten the canvas seams together. Heretofore the sections were laced together—a long and arduous rigging process. With the total number of performances of the circus numbering 426—and 325 of those under canvas—minutes saved in rigging account for tremendous dollar savings in the course of a year.

1954 Edition of "The Aluminum Data Book" Published by Reynolds

Featuring much new information not found in previous issues, as well as a new die-cut thumb-indexing system, the 1954 edition of "THE ALUMINUM DATA BOOK" has just been issued by **Reynolds Metals Company.** It offers 220 pages of detailed data on the properties and characteristics of aluminum—the most complete and up-to-date source of technical information on aluminum today.

★ ★ ★

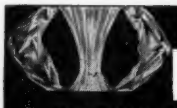
To make this vast collection of information readily available, the book includes a table of contents, a 2-page index of tabular matter, and a 20-page itemized cross index with references both to text and tabular information.

★ ★ ★

New information presented for the first time in this edition includes the radioactive isotopes of aluminum, thermal neutron absorption cross sections for various metals, as well as the elements

Wire Drawing Diamond Dies

COCHAUD WIRE DIE INC.
300 W. 56th St., NEW YORK
Tel. COlumbus 5-1340



DIAMOND DIES
PROFILED DIES
FINE SIZE DIES
VICTOR J. BOULIN INC.
250 E. 43rd St., New York 17, N.Y.

DIAMOND DIES CARBIDE
KELLY
WIRE DIE CORPORATION
19 W. 34th St. New York

DIAMOND WIRE DRAWING DIES and DIAMOND POWDER
INDIANA WIRE DIE COMPANY
314-324 E. Wallace St., Fort Wayne, Indiana
Phone: Harrison 4373

DIAMOND AND CARBIDE WIRE DRAWING DIES
DIAMOND POWDER
RUSCH WIRE DIE CORPORATION
Croton-on-Hudson, N. Y.

PITTSBURGH **CARBIDE** DIE CO.
Monongahela, Penna.
NAIL TOOLING
Export
SEYBOLD TRANSWORLD EXPORTERS
122 East 42nd St., New York 17, N. Y.

DIAMOND
and
TUNGSTEN CARBIDE
DIES
for all WIRE DRAWING purposes.
SPECIALISTS IN DIE REPAIR WORK ON ALL TYPES OF DIES.
UNIVERSAL WIRE DIE CO.
951 Lincoln Ave., Cranford, N. J.
CRanford 6-0116

found in commercial aluminum alloys.

★ ★ ★

The "availability" section is entirely new, showing for the first time manufacturing limits not only on standard aluminum mill products, but listing "Grades Manufactured" on aluminum powders and pastes, as well as details on aluminum chemical products such as calcined alumina, activated alumina, and aluminum trihydrate.

★ ★ ★

The new alloy designation system just adopted by The Aluminum Association is covered in a special-colored section which features two tables listing old alloy designations with equivalent new system designations, and new designations with equivalent old system labels.

★ ★ ★

Material in this edition of "The Aluminum Data Book" was prepared by **B. E. Brennan** and **J. H. Pyles.** The book was edited and produced by **G. W. Birdsall,** all of Reynolds Metals Company.

★ ★ ★

This 220-page, 6 x 8-inch manual is ring-bound to lie flat when open. It will be sent without charge to any engineer, designer, technical man, instructor, or executive who may request it on company letterhead. To all others, the price is $1.00 per copy, postpaid. Address your request to Reynolds Metals Company, Desk PR, 2500 South Third Street, Louisville 1, Kentucky.

New Booklet on High Voltage Transmission Cable

Reaching a new horizon in electric power transmission—300 KV and above—is the subject of "ALCOA EXPANDED ACSR For 'Superhigh' Voltage Transmission," recently published by **Aluminum Company of America.**

★ ★ ★

Expanded ACSR, is a conductor specially suited for "super-high" voltages. The new booklet describes basic research and engineering investigations and laboratory and field trial tests in-

DIAMOND POWDER
ALL MESH and MICRON SIZES
Virgin or Reclaimed
Diamond Powders Available
•
Salvage service on diamond-bearing Sludges, Wheels, Lapping Cotton.
Write for free literature
•
INDUSTRIAL DIAMOND POWDERS, INC.
SYcamore 3-3308
Box 5769 Homewood Sta., Pittsburgh 8, Pa.

DIAMOND DIES .0006 - .120 DIAMOND POWDER
INDUSTRIAL AJAX SUPPLIES INC.
R.R. 4, P. O. Box 66, Fort Wayne, Ind.

NEW ENGLAND WIRE DIE CO.
7 Forsberg St., Worcester, Mass.
EXPERT RECUTTING
DIAMOND DIES, DIAMOND POWDERS
Eastern Representative of
Ajax Industrial Supplies, Inc.

DIAMOND DIES
.000's to .102"
For many years . . .
Outstanding in quality,
workmanship and service.
FORT WAYNE WIRE DIE, INC.
2625 E. Pontiac St., Fort Wayne, Ind.

Manufacturers of Laboratory Graded Pure
DIAMOND POWDERS
DIAMOND WIRE DRAWING DIES
in .000 sizes
EXPERT RECLAIMING SERVICE
MOLINA
INDUSTRIAL DIAMOND CO., INC.
527 Fifth Ave., N. Y. 17, N. Y.
Tel.: MUrray Hill 7-6825

WOOD REELS and SPOOLS
American Woodworking Company
1" to 60" Diameters. Send for our free catalogue of all wood products made in the U. S. A.
1674 N. Lowell Avenue
Chicago 39, Illinois

Wire Measuring...
PRODUCTIMETERS
Send for Catalog No. 40
Precision-built for accuracy and speed. Most complete line offered
DURANT MANUFACTURING CO.
1918 N. Bullum Street, Milwaukee 1, Wisconsin • 118 S. Water St., Providence 3, R. I.

SLEEPER & HARTLEY, Inc.
Designers and Builders
SPRING COILERS
WIRE WORKING MACHINERY
WIRE MILL EQUIPMENT
SPECIAL MACHINERY
Address Inquiries to
Box 1249
WORCESTER, MASS.

EMORY
SPOOLERS AND TRAVERSES
ROBERT J. EMORY CO.
31 E. RUNYON ST., NEWARK 5, N. J.

WOOD & PLYWOOD REELS
for WIRE ROPE and
INSULATED WIRE & CABLE
THE NELSON COMPANY
Standard Oil Bldg., Baltimore 2, Md.

NEBUTT CO.
MACHINERY FOR HIGH SPEED PRODUCTION
BRAIDERS TAKE-UPS STRANDERS
CABLERS BUNCHERS TAPING MACHINES
NEW ENGLAND BUTT COMPANY
304 Pearl Street, Providence 7, R. I.
James Day (Machinery) Ltd.
28 Maddox Street, London W1, England

NEP · SUMFOAM
ACID INHIBITOR • PICKLING COMPOUND
THE PARKIN CHEMICAL CO.
HIGHLAND BLDG. PITTSBURGH 6, PA.

ZINC WIRE
THE PLATT BROS. & CO.
Waterbury 20, CONN.

WF Wire Drawing Machinery
Continuous Drawing Machines For Heavy, Intermediate and Fine Sizes
High Speed Upright Cone Machines, Wire Rolling Machines, Spoolers, Coiners, Swagers, Pointers, Stringup Machines, Coilers, Bull Blocks, etc.
Also: Wire Flattening Mills, Cold Heading Machinery, etc.
WATERBURY FARREL FOUNDRY & MACHINE CO.
Waterbury, Conn.

TOOLS TALIDE DIES
WEAR PARTS
Talide Metal, the super hard tungsten carbide gives increased production, better finish, less down time and scrap on all wire mill operations.
METAL CARBIDES CORPORATION
YOUNGSTOWN 5, OHIO

"PARALAN"
Rust Preventatives
Lubricants
AMERICAN LANOLIN CORP.
Lawrence, Mass.

CHEMSTEEL CONSTRUCTION COMPANY, INC.
205 Chemsteel Bldg., Walnut St., Pittsburgh 32, Pa.
Send data on Engineering & Construction facilities for
ACID-ALKALI-PROOF CONSTRUCTION
of pickling and other tanks; flooring.
(TEAR OUT & MAIL WITH LETTERHEAD)

CREPED PAPER
COIL OR BAR WRAPS
NATIONAL WATERPROOF PAPERS, INC.
CAMDEN 1, N. J.

SURFACE COMBUSTION TOLEDO 1, OHIO
Surface
HEAT TREATING EQUIPMENT

WIRE ANNEALING
FURNACES and PROCESSES
COIL LOADING and STRIPPING
MACHINES—WIRE SPIDERS
LEE WILSON ENGINEERING CO., INC.
Cleveland, Ohio • EDison 1-6600

Immediately Available
WIRE WORKING MACHINERY
FOURSLIDES: Baird, Nilson & Manville, Nos. 0, 1, 2, 3, 4, 5, 3-20, 4-26
U. S. Tool Co. No. 22, 28, & 33 Multislides
Sleeper & Hartley Spring Coilers Nos. 0, 1, 2, 3, 3½, 4, & 5
Vaughn Nos. 8, 10, & 12 Moto-Blocs
Waterbury No. 3 Bull Blocks, Duplex
Morgan 4 stand Wire Drawer with pointer and 100 H.P. motor drive & motor
Waterbury Nos. 1, 2, & 3 Continuous Wire Drawing Machines
PARTIAL STOCK LISTING
"The most diversified stock of machinery in the country. If it's machinery we have it."
National Machinery Exchange
130 Mott St., New York 13, N. Y.
CAnal 6-2470

volved in the development of the new conductor. With 1200 miles installed on American Gas & Electric lines, Alcoa's Expanded ACSR has proven its commercial practicality. 2500 miles are scheduled for the vast Ohio Valley Electric Corporation (OVEC) system.

* * *

Technical aspects of cable construction, line erection techniques, and special accessories are described in the booklet. Stress-strain and sag-tension information is included.

* * *

The 16-page, two-color booklet contains both drawings and charts, as well as photographs of installed lines and line construction operations.

* * *

Copies may be secured from Alcoa Sales Offices or from Aluminum Company of America, 732 Alcoa Building, Pittsburgh 19, Pa.

To Handle Radio & T.V. Sales for Wire Company

Albert J. Borelli is the new sales manager of **National Electric Products Corporation's** Television and Radio Department, according to an announcement made today by **R. C. Bennett, Jr.**, vice president in charge of sales for the firm.

* * *

Mr. Borelli, formerly chief engineer of the firm's Electronics Division at Ambridge, Pa., succeeds **F. P. Yarussi** who leaves the firm to continue sales activities in a representative sales organization here.

* * *

A 1943 graduate of Carnegie Institute of Technology where he earned a degree in electrical engineering, Mr. Borelli has had 20 years experience in the electronics field. During World War II he served as a captain in the U. S. Army Signal Corps. He was a radio communications officer, attached to the Army Air Force.

To prolong the wear and life of ROPE it pays to specify MADESCO BLOCKS
MADESCO TACKLE BLOCK CO., EASTON, PA.

CLEVELAND TRAMRAIL
Division of
THE CLEVELAND CRANE & ENGINEERING CO.
WICKLIFFE, OHIO
Leading manufacturers of
OVERHEAD MATERIALS HANDLING EQUIPMENT
for the Wire and Wire Products Industry

CORROSION-PROOF LININGS CEMENTS BRICK
• TANKS, FLOORS, FUME DUCTS AND PROCESS EQUIPMENT
• COMPLETE LINE OF PROTECTIVE COATINGS..
Over a Quarter Century of Experience
CEILCOTE CORROSION-PROOF
MATERIALS • CONSTRUCTION • SUPERVISION
The CEILCOTE Company 4832 Ridge Rd. Cleveland 9, O.

STANDARD UNI-DRIVE WIRE WINDER
WILL INCREASE YOUR PRODUCTION
Write for details.
STANDARD MILL SUPPLY
1064-1080 MAIN ST., PAWTUCKET, R. I.

Wire Drawing Machines.
Galvanizing & Tinning Installations.
Wire Flattening Mills.
Spooling Machines.
STEEL EQUIPMENT CO.
P.O. Box 737, Warrensville Station
Cleveland 22, Ohio

MODEL T-3 TORSION TESTER FOR WIRE
SCOTT TESTERS INC. 55 BLACKSTONE ST. PROVIDENCE 1, R.I.

WIRE DRAWING MACHINERY AND EQUIPMENT
Rod Frames — 16" Frames, 8" Frames — Take-Up Frame, Wire — Pointers — Puller Tongs — General and heat resisting alloy castings for wire mill use.
Circulars on Request
E. J. SCUDDER FOUNDRY & MACHINE CO.
TRENTON, N. J.

WORLD'S LARGEST MANUFACTURER
SPIRAL WRAPPING MACHINES
For Coils or Straight Lengths
Terkelsen Machine Company
323 A Street, Boston 10

To Sell Alkyd Resins for G.E.

Richard J. Thompson has been appointed Salesman — Alkyd Resin Products Sales, in **General Electric Company's** Chemical Materials Department, according to **George M. Hartley,** Manager—Alkyd Resin Products Sales.

★ ★ ★

Mr. Thompson, a native of Schenectady, N. Y., received his MS degree in Chemistry from Penn State University. He comes to General Electric from the Trojan Powder Company where he was a technical sales representative.

Sheffield-Armco Consolidation Consummated

Sheffield Steel Corporation was consolidated on June 30th with **Armco Steel Corporation,** which acquired all the property and assets and assumed all liabilities and obligations of Sheffield Steel Corporation.

★ ★ ★

The business formerly carried on by Sheffield Steel Corporation will hereafter be operated as **Sheffield Steel, Division of Armco Steel Corporation.**

★ ★ ★

This is a change in corporate structure only. It does not involve any change in officers, personnel, policies, business relationships or present method of operations.

Page Opens District Office in Houston

The Page Steel & Wire Division of American Chain & Cable Company has opened a district office at 630 McFarland Street, Houston 1, Texas. **J. J. Cassidy,** former sales representative for the division in the Southwestern territory, has been appointed district sales manager.

★ ★ ★

The new Page district office will cover the states of Oklahoma, Arkansas, Louisiana west of the Mississippi River, and all of Texas with the exception of the six western-most counties.

★ ★ ★

Engineering and Professional Services

CONSULTING WIRE MILL ENGINEER
Specializing in Wire Mill Machinery, Plant Layout and Production Techniques.
CLARENCE S. ARMS
Sleeper & Hartley, Incorporated
P.O. Box 1249 • Worcester, Mass.

WALLACE G. IMHOFF CO.
CONSULTANTS IN
ZINC COATINGS
11983 Woodbine St.
LOS ANGELES 34 • CALIFORNIA

LANCASTER, ALLWINE & ROMMEL
REGISTERED PATENT ATTORNEYS
Suite 438, 815—15th St., N. W.
Washington 5, D. C.
•
Practice before U. S. Patent Office. Validity and Infringement Investigations and Opinions. Booklet and form "Evidence of Conception" forwarded upon request.

The Page Steel & Wire Division manufactures a diversified line of fence and wire products, including the new ACCO aluminized wire, at its Monessen, Pa. plant.

To Head New Product Division For Page

Announcement has been made of the appointment of **E. B. Brant** as product manager, ACCO Aluminized Wire and Wire Products, **Page Steel & Wire Division, American Chain & Cable Company,** Monessen, Pa.

★ ★ ★

Mr. Brant, an employee of 38 years service with the Page Steel & Wire Division, has been Pittsburgh district sales manager since 1947. Previously, he was associated with the division's general sales office and, in 1945, opened a Page sales office in Detroit.

★ ★ ★

"Acco Aluminized" is the trade name of a new process for coating steel wire with aluminum which has just been announced by the Page Division. The field of application is expected to be far reaching due to the wire's superior weather resistance.

TO SELL—ADVERTISE IN WIRE AND WIRE PRODUCTS
It pays—send for rates
354 Main St., Stamford, Conn.

SUPERINTENDENT
Midwestern mill has opening for Superintendent with metallurgical and practical operation background. Experience on all finishes of wire required with emphasis on hot dip galvanizing. Please include complete resume of work experience. Write Box 700.

SALESMAN WANTED
Established wire manufacturer of Round and Flat High Carbon Specialty Wire for New England Territory. Please give detailed information stating qualifications which will be held confidential. Reply Box No. 760.
WIRE AND WIRE PRODUCTS
453 Main Street Stamford, Conn.

WANTED SALESMAN
Age 30 to 45. Widely acquainted with Wire and Textile mills throughout New England, Northern New York State, Eastern Pennsylvania and Maryland. Permanent position to proper person should live within areas indicated and have experience in Wire and Cable Industry. As well as knowledge necessary for salesman in these fields. This position with well established reliable company in middle West. Compensation in proportion with experience. All replies confidential.
Address Box No. 763
WIRE & WIRE PRODUCTS

WANTED
Vaughn or Morgan Heavy Motoblocks from 16" to 24" dia. Power Pointer 7/16" Max. Capacity. Advise condition, accessories, lowest possible price.
Reply to—Box 761
WIRE AND WIRE PRODUCTS
Stamford Connecticut

FINE WIRE FOREMAN
Fine opportunity to take full charge of low carbon fine wire drawing—annealing—tinning—galvanizing, old medium sized well established Midwestern Company.
Box 735
WIRE & WIRE PRODUCTS
453 Main St., Stamford, Conn.

Index to Advertisers

A

Acrometal Products, Inc. 966
Ajax Electric Company 976-B
Ajax Industrial Supplies, Inc. 1037
American Chemical Paint Company 996
American Insulating Machinery Company 1004
American Lanolin Corp. 1038
American Steel & Wire Div., U. S. Steel Corp. ..... 944 & 945
American Woodworking Co. 1037
Apco Mossberg Co. 1020
Arms, Clarence S. 1039

B

Baird Machine Co., The 941
Balloffet-Vianney Wire Die Co., Inc. 1034
Bethlehem Steel Co. 957
Bick, Inc., Hans C. 1020
Boulin, Victor J., Inc. 1036
Boyd & Sons Mfg. Corp. 1021
Bridge Mfg. Co. 939

C

Camden Wire Co., Inc. 1004
Carboloy Dept. of General Electric ..... 986 & 987
Carl-Mayer Corp., The 1022
Ceilcote Co. 1038
Chase Brass & Copper Co. 931
Chemsteel Construction Co., Inc. 1038
Clark Mfg. Co., J. L. 1006
Cleveland Tramrail Division of The Cleveland Crane & Engineering Co. 1038
Cochaud Wire Die Inc. 1036
Colorado Fuel & Iron Corp. 1023
Columbia-Geneva Steel Div., U. S. Steel Corp. ..... 944 & 945
Continental Steel Corporation 942
Cook Mfg. Co. 940
Cook's Sons Inc., Adam 1022
Coulter & McKenzie Machine Co., Inc., The 954
Crucible Steel Company of America 935

D

Danforth Co., C. W., The 1033
Davis-Standard Sales Corp. 974
du Pont de Nemours & Co., (Inc.) E. I. 930
Durant Mfg. Co. 1037
Durkee Mfg. Co. 1035
Dykrex Corporation of America—Roos Tool & Mfg Div. 1028

E

Eastern Carbide Corp. 1035
Eisler Engineering Co., Inc. 1033
Electric Furnace Company, The ..... Back Cover
Electronic Rubber Co. 1023
Elgin National Watch Co., Abrasives Div. 934
Emory, Robert J. Company 1037

F

Firth Sterling, Inc. 929
Fisher Associates ..... 1033 and 1034
Fort Wayne Wire Die, Inc. 1037

G

Glader, Wm. Machine Works 1002

H

Harper Electric Furnace Corp. 999
Haskell-Dawes Machine Co., Inc. 1029
Haveg Corporation 1030
Heany Industrial Ceramics Corp. 1032
Heil Process Equipment Corp. 1010
Herborn 956
Hubbard Spool Company 953

I

Imhoff, Wallace G., Co. 1039
Indiana Wire Die Company 1036
Iudustrial Diamond Powders, Inc. 1037
Industrial Ovens, Inc. 936
Interlocking Fence Co. 1009
International Wire Products Corp. 1018

J

Johnson Steel & Wire Co., Inc. 997

K

Kay & Warren Co. 1026
Kelly Wire Die Corporation 1036
Keystone Steel & Wire Company 1000
Kilmer, M. D. & Co. 1033

L

Lancaster, Allwine & Rommel 1039
Lewis Machine Company, The 1008

M

Madesco Tackle Block Co. 1038
Malin & Company, The 1035
Mason Can Company 1027
McCaskie, Wm., Inc. 1032
Metal Carbides Corporation 1038
Metal and Thermit Corporation 1019
Mettler Machine Tool, Inc. 946
Micro Products Company 995
Miller, R. H. Co., Inc. 960
Milton Machine Works, Inc. 1019
Molina Industrial Diamond Co., Inc. 1037
Montgomery Co., The 1034
Morgan Construction Company 932
Morgardshammers Mek. Verstads A. B. 937
Mossberg Pressed Steel Corp. 1003
Mummert-Dixon Co. 1024

N

National Gypsum Co. 1025
National Lock Washer Co., The 947
National Machinery Exchange 1038
National Research Co. 1032
National Waterproof Papers, Inc. 1038
National Wire Die Corp. 1005
Nelson Company, The 1037
New England Butt Company 1037
New England Lacquer Co. 1028
New England Wire Die Co. 1037
New York Engineering Co. 1001
Niehaus Maschinenfabrik 1012
Nilson Machine Co., The, A. H. 1011
Nopco Chemical Co. 938
Nord International Corp. 1012
North American Philips Co., Inc. 1036
Norton Company 1014

P

Pacific Coast Borax Company 1029
Parkin Chemical Co., The 1037
Parkway-Kew Corp. 1031
Peschel Electronics, Inc. 1024
Pittsburgh Carbide Die Co. 1036
Pittsburgh Steel Company ..... 968 & 969
Platt Brothers & Co., The 1037
Porter, H. K. Inc. 1032
Pourtier Freres, Ets. 1013

R

Republic Steel Corp., Pressed Steel Div. 933
Rockwell, W. S. Co. 1015
Roebling's John A. Sons, Corp. 976-A
Royle, John & Sons 1017
Rusch Wire Die Corporation 1036

S

Schumag Schumacher Metallwerke 948
Scott Testers, Inc. 1038
Scudder, E. J. Foundry & Machine Co. 1038
Seybold Transworld Exporters 1030
Shell Oil Company 955
Sjogren Tool and Machine Co., Inc. 1007
Sleeper & Hartley, Inc. 1037
Spencer Wire Corp. 1026
Standard Industrial Compounds Co., Inc. 949
Standard Mill Supply Co. 1038
Steel Equipment Co. 1038
Strand-Buffalo Corp. 1034
Surface Combustion Corp. 1038
Swift & Company 952
Syncro Machine Company 943

T

Tennessee Coal & Iron Div. ..... 944 & 945
Terkelsen Machine Co. 1038
Torrington Mfg. Co. 998

U

U. S. Steel Export Co. ..... 944 & 945
Universal Wire Die Co. 1036
Utica Drop Forge and Tool Corp. 950

V

Vascoloy-Ramet Corporation 958
Vaughn Machinery Company, The ..... Front Cover

W

Wafios 1016
Waterbury Farrel Foundry & Machine Co. 1037
Watson Machine Company, The ..... Inside Back Cover
Wayne Wire Die Co. 1035
Wean Equipment Corporation ..... Inside Front Cover
Wilson, Lee Engineering Co., Inc. 1038
Wire Insulating Mach'y Inc., Div. of Machinery Electrific, Inc. 1016
Wire & Textile Machinery, Inc. 1031
Wire Tool Div., Bridgeport Jig Boring Co. 1031

Y

Youngstown Sheet & Tube Company, The 951

WHERE TO BUY

For more complete information, consult the annual Wire and Wire Products Buyers' Guide.
Only advertisers who have contracted for six or more insertions are listed in this section.

ABRASIVES—
Elgin National Watch Co., Abrasives Div., Elgin, Ill.
Hyprez Div., Engis Equipment Co., Chicago, Ill.
Norton Co., Worcester, Mass.

ACID INHIBITORS—
(See Inhibitors, Pickling)

ACID-PROOF CONSTRUCTION—
Ceilcote Company, Cleveland, Ohio
Chemical Construction Co., Pittsburgh, Pa.
Haveg Corporation, Newark, Del.
Heil Process Equipment Corp., Cleveland, Ohio

ALLOYS—Hardsurfacing Capstans, etc.
Parkway-Kew Corp., Menlo Park, N. J.

ANNEALING MACHINES — Electric Resistance
Syncro Machine Co., Perth Amboy, N. J.
Trauwood Engr. Co., Cleveland, O.

ANNEALING POTS AND BOXES—
Scudder, E. J. Fdry. & Mach. Co., Trenton, N. J.

BAKERS—
(See OVENS—Rod Bakers)

BARRELS—for Wire Packaging
Continental Can Co., New York, N. Y.

BOBBINS—Braider & Wire Weaving
Acrometal Products, Inc., Minneapolis, Minn.
Apco Mossberg Co., Attleboro, Mass.
Milton Machine Works, Inc., Milton, Pa.
Mossberg Pressed Steel Corp., Attleboro, Mass.
Standard Mill Supply Co., Pawtucket, R. I
Wardwell Braiding Machine Co., Central Falls, R. I.
Wire & Textile Mach'y, Inc (used) Pawtucket. R. I.

BORAX—Wire Drawing
Pacific Coast Borax Co., New York, N. Y.

BORON CARBIDE—
Norton Co., Worcester, Mass.

CARRIERS—Braider, High Speed
Apco Mossberg Co., Attleboro, Mass.
Mossberg Pressed Steel Corp., Attleboro, Mass.
New England Butt Co., Providence, R. I.
Wardwell Braiding Machine Co., Central Falls, R. I.
Wire & Textile Mach'y, Inc. (used) Pawtucket. R. I.

CASTINGS—Wire Mill
Scudder, E. J. Fdry. & Mach. Co., Trenton, N. J.

CEMENTS—Acid Proof
Ceilcote Company, Cleveland, Ohio

CEMENTS—Refractory
Norton Co., Worcester, Mass.

CLEANERS—Metal
American Chemical Paint Co., Ambler, Pa.
Apex Alkali Products Co., Phila., Pa.
Metal & Thermit Corp., New York, N. Y.
Parkin Chemical Co., The, Pittsburgh, Pa.
Standard Industrial Compounds Co., Chicago.

CLEANING & PICKLING EQUIP.—
Ceilcote Company, Cleveland, Ohio
Chemsteel Construction Co., Pittsburgh, Pa.
Cleveland Tramrail Div., of the Cleveland Crane & Engineering Co., Wickliffe, O.
Haveg Corporation, Newark, Del.
Morgan Construction Co., Worcester, Mass.
Vaughn Machinery Co., Cuyahoga Falls, O.
Wean Equipment Corp., Cleveland, Ohio
Wilson, Lee, Engr. Co., Cleveland, Ohio
Youngstown Welding & Eng'g Co., Youngstown, Ohio.

CLOTH—WIRE, All Metals
Chase Brass & Copper Co., Waterbury, Conn.
Wickwire Bros., Cortland, N. Y.

COATING COMPOUNDS—
Apex Alkali Products Co., Philadelphia, Pa.
Miller, R. H., Co., Inc., Homer, N. Y
Standard Industrial Compounds Co., Chicago

COMPOUNDS—Coppering
American Chemical Paint Co., Ambler, Pa.
Miller, R. H. Co., Inc., Homer, N. Y.

COMPOUNDS—Diamond (Pre-Mixed)
Eastern Carbide Corp., New Rochelle, N. Y.
Elgin National Watch Co., Abrasives Div., Elgin, Ill.
Hyprez Div., Engis Equipment Co., Chicago.
United States Industrial Diamond Corp., New York, N. Y.

COMPOUNDS—Extrusion, for Wire
(See COMPOUNDS—Vinyl)

COMPOUNDS—For Improving Drawing and Extrusion
American Chemical Paint Co., Ambler, Pa.

COMPOUNDS—Metal Finishing
American Chemical Paint Co., Ambler, Pa.
Apex Alkali Products Co., Philadelphia, Pa.
Metal & Thermit Corp., New York, N. Y.

COMPOUNDS—Phosphate Coating
American Chemical Paint Co., Ambler, Pa.

COMPOUNDS—Rust Preventing
American Chemical Paint Co., Ambler, Pa.
American Lanolin Corporation, Lawrence, Mass.
Apex Alkali Products Co., Philadelphia, Pa.

COMPOUNDS—Rust Removing
American Chemical Paint Co., Ambler, Pa.
Apex Alkali Products Co., Philadelphia, Pa.
Standard Industrial Compounds Co., Chicago.

COMPOUNDS—Vinyl, for Wire
Electronic Rubber Co., Stamford, Conn.

COMPOUNDS—Wire Drawing
Apex Alkali Products Co., Philadelphia, Pa.
Bick, Hans C., Inc., Reading, Pa.
Cook's Sons, Inc., Adam, Linden, N. J.
Miller, R. H. Co., Inc., Homer, N. Y.
Nopco Chemical Co., Harrison, N. J.
Pacific Coast Borax Co., New York, N. Y.
Standard Industrial Compounds Co., Chicago.
Swift & Company, Chicago, Ill.

CONDUCTORS—Flexible, Electrical
Montgomery Co., The, Windsor Locks, Conn.

COPHOLDERS—Steel
Apco Mossberg Co., Attleboro, Mass.
Mossberg Pressed Steel Corp., Attleboro, Mass.
Wire & Textile Mach'y, Inc. (used) Pawtucket. R. I.

CORDS—Electrical, Tinsel Conductor
Montgomery Co., The, Windsor Locks, Conn.

CRANES—Wire Mill
Cleveland Tramrail Div. of the Cleveland Crane & Engineering Co., Wickliffe, O.
Morgan Construction Co., Worcester, Mass.
Vaughn Machinery Co., Cuyahoga Falls, O.

CUTTING TOOLS—Carbide
Carboloy Dept. of General Electric Co., Detroit.
Eastern Carbide Corp., New Rochelle, N. Y
Firth Sterling, Inc., Pittsburgh, Pa.
Metal Carbides Corporation, Youngstown, Ohio
Rusch Wire Die Corp., Croton-on-Hudson, N. Y.
Utica Drop Forge & Tool Corp., Utica, N. Y.
Vascoloy-Ramet Corp., Waukegan, Ill.
Willey's Carbide Tool Co., Detroit, Mich.

CUTTING TOOLS—Wire
Porter, H. K. Inc., Somerville, Mass.

DESCALING PROCESS—Sodium Hydride
du Pont de Nemours & Co., Inc., E. I., Wilmington, Del.
Fisher Associates, New York, N. Y.

DIAMONDS—Industrial
Balloffet-Vianney Wire Die Co., Inc., Guttenberg, N. J.
Molina Industrial Diamond Co., New York, N. Y.
Rusch Wire Die Corp., Croton-on-Hudson, N. Y.
United States Industrial Diamond Corp., New York, N. Y.
Wayne Wire Die Co., Hillside, N. J.

DIAMOND POWDERS—
Danforth, The C. W. Co., Youngstown, Ohio
Elgin National Watch Co., Abrasives Div., Elgin, Ill.
Hyprez Div., Engis Equipment Co., Chicago, Ill.
Indiana Wire Die Co., Ft. Wayne, Ind.
Industrial Diamond Powders, Pittsburgh, Pa.
Molina Industrial Diamond Co., New York, N. Y.
National Research Company, St. Clair Shores, Mich.
New England Wire Die Co., Worcester, Mass.
Rusch Wire Die Corp., Croton-on-Hudson, N. Y.
United States Industrial Diamond Corp., New York, N. Y.
Universal Wire Die Co., Cranford, N. J.
Wayne Wire Die Co., Hillside, N. J.

DIAMOND POWDER RECLAIMING—
Danforth, The C. W. Co., Youngstown, Ohio
Industrial Diamond Powders, Pittsburgh, Pa.
Kay & Warren Co., Brooklyn, N. Y.
National Research Co., St. Clair Shores, Mich.
Molina Industrial Diamond Co., New York, N. Y.
Rusch Wire Die Corp., Croton-on-Hudson, N. Y.

DIAMOND TOOLS—
Indiana Wire Die Co., Ft. Wayne, Ind.
Metal Carbides Corporation, Youngstown, Ohio
Nord International Corp., Orange, N. J.
Universal Wire Die Co., Cranford, N. J.
Wayne Wire Die Co., Hillside, N. J.
Willey's Carbide Tool Co., Detroit, Mich.

DIES—Carbide, Tungsten & Tantalum
Balloffet-Vianney Wire Die Co., Inc., Guttenberg, N. J.
Boulin, Victor J., Inc., New York, N. Y.
Carboloy Dept. of General Electric Co., Detroit.
Eastern Carbide Corp., New Rochelle, N. Y.
Firth Sterling, Inc., Pittsburgh, Pa.
Indiana Wire Die Co., Fort Wayne, Ind.
Kelly Wire Die Corp., New York, N. Y.
Metal Carbides Corp., Youngstown, O.
Rusch Wire Die Corp., Croton-on-Hudson, N. Y.
Universal Wire Die Co., Cranford, N. J.
Vascoloy-Ramet Corp., Waukegan, Ill.
Wayne Wire Die Co., Hillside, N. J.
Willey's Carbide Tool Co., Detroit, Mich.

DIES—Cold Heading
Carboloy Dept. of General Electric Co., Detroit
Eastern Carbide Corp., New Rochelle, N. Y.
Firth Sterling, Inc., Pittsburgh, Pa.
Indiana Wire Die Co., Ft. Wayne, Ind.
Metal Carbides Corporation, Youngstown, Ohio
Vascoloy-Ramet Corp., Waukegan, Ill.
Willey's Carbide Tool Co., Detroit, Mich.

DIES—Diamond
Ajax Industrial Supplies, Inc., Fort Wayne, Ind.
Balloffet-Vianney Wire Die Co., Inc., Guttenberg, N. J.
Boulin, Victor J., Inc., New York, N. Y.
Cochaud Wire Die Inc., New York, N. Y.
Ft. Wayne Wire Die, Inc., Fort Wayne, Ind.
Indiana Wire Die Co., Ft. Wayne, Ind.
Kelly Wire Die Corp., New York, N. Y.
Molina Industrial Diamond Co., New York, N. Y.
New England Wire Die Co., Worcester, Mass.
North American Philips Co., Inc., Elmet Div., Lewiston, Me.
Rusch Wire Die Corp., Croton-on-Hudson, N. Y.
Universal Wire Die Co., Cranford, N. J.
Wayne Wire Die Co., Hillside, N. J.

DIES—Extrusion
Carboloy Dept. of General Electric Co., Detroit.
Eastern Carbide Corp., New Rochelle, N. Y.
Firth Sterling, Inc., Pittsburgh, Pa.
Metal Carbides Corporation, Youngstown, Ohio
Rusch Wire Die Corp., Croton-on-Hudson, N. Y.
Universal Wire Die Co., Cranford, N. J.
Wayne Wire Die Co., Hillside, N. J.
Willey's Carbide Tool Co., Detroit, Mich.

DIES—Eyelet
Eastern Carbide Corp., New Rochelle, N. Y.
Kelly Wire Die Corp., New York, N. Y.

DIES—Nail, Nail Cutters, Feeder Blocks, Grippers, etc.
Firth Sterling, Inc., Pittsburgh, Pa.
Pittsburgh Carbide Die Co., Monongahela, Pa.

DIES—Pointing
Sjogren Tool and Machine Co., Auburn, Mass.

DIES—Repairs & Re-Cutting
Ajax Industrial Supplies, Inc., Fort Wayne, Ind.
Balloffet-Vianney Wire Die Co., Inc., Guttenberg, N. J.
Boulin, Victor J., Inc, New York, N. Y.
Carboloy Dept. of General Electric Co., Detroit.
Cochaud Wire Die Inc., New York, N. Y.
Eastern Carbide Corp., New Rochelle, N. Y.
Firth Sterling, Inc., Pittsburgh, Pa.
Ft. Wayne Wire Die., Inc., Fort Wayne, Ind.
Indiana Wire Die Co., Ft. Wayne, Ind.
Kelly Wire Die Corp., New York, N. Y.
Metal Carbides Corporation, Youngstown, Ohio
New England Wire Die Co., Worcester, Mass.
North American Philips Co., Inc., Elmet Div., Lewiston, Me.
Rusch Wire Die Corp., Croton-on-Hudson, N. Y.
Universal Wire Die Co., Cranford, N. J.
Vascoloy-Ramet Corp., Waukegan, Ill.
Wayne Wire Die Co., Hillside, N. J.

DIES—Special Shapes, Etc.
Eastern Carbide Corp., New Rochelle, N. Y.
Firth Sterling, Inc., Pittsburgh, Pa.
Indiana Wire Die Co., Ft. Wayne, Ind.
Willey's Carbide Tool Co., Detroit, Mich.

DIES—Swaging
Sjogren Tool and Mach. Co., Inc., Auburn, Mass.

DIES—Tube Drawing
Balloffet-Vianney Wire Die Co., Inc., Guttenberg, N. J.
Carboloy Dept. of General Electric Co., Detroit.
Eastern Carbide Corp., New Rochelle, N. Y.
Firth Sterling, Inc., Pittsburgh, Pa.
Indiana Wire Die Co., Fort Wayne, Ind.
Kelly Wire Die Corp., New York, N. Y.
Metal Carbides Corp., Youngstown, O.
Rusch Wire Die Corp., Croton-on-Hudson, N. Y
Vascoloy-Ramet Corp., Waukegan, Ill.
Willey's Carbide Tool Co., Detroit, Mich.

DRAW BENCHES—
(See MACHINERY—Draw Benches)

DRUMS & TRAVERSES—For Cable Reels
Hubbard Spool Co., Garrett, Ind.
New York Engineering Co., Yonkers, N. Y.
Republic Steel Corp., Pressed Steel Div., Niles, Ohio

DRYING EQUIPMENT
Carl-Mayer Corp., The, Cleveland, Ohio
Industrial Ovens, Inc., Cleveland, Ohio.
Michigan Oven Co., Detroit, Mich.
Rockwell, W. S. Co., Fairfield, Conn.

ENGINEERS—Consulting
Lubricants—Hans C. Bick, Inc., Reading, Pa.
Wire Mill—Clarence S. Arms, Worcester, Mass.
Zinc—Imhoff, Wallace G. Co., Los Angeles, Calif.

EYELETS—Brass or Zinc
Platt Bros. & Co., The, Waterbury, Conn.

FENCING & FENCES—Wire
Interlocking Fence Co., Morton, Ill.

FOAM PRODUCING COMPOUNDS—
American Chemical Paint Co., Ambler, Pa.
Parkin Chemical Co., The, Pittsburgh, Pa.

FURNACES—Brazing
Electric Furnace Co., Salem, Ohio
Harper Electric Furnace Corp., Buffalo, N. Y.
Lepel High Frequency Laboratories, Inc., New York, N. Y.
Rockwell, W. S. Co., Fairfield, Conn.

FURNACES—Galvanizing Equipment
Ajax Electric Co., Inc., Phiadelphia, Pa.
Electric Furnace Co., Salem, Ohio
Rockwell, W. S. Co., Fairfield, Conn.
Surface Combustion Corp., Toledo, Ohio
Trauwood Engineering Co., The, Cleveland, Ohio
Wilson, Lee, Engr. Co., Cleveland, Ohio

FURNACES—Heat Treating
Ajax Electric Co., Inc., Philadelphia, Pa.

WHERE TO BUY, Continued

For more complete information, consult the annual Wire and Wire Products Buyers' Guide.

Carl Mayer Corp., The, Cleveland, Ohio
Electric Furnace Co., Salem, Ohio
Drever Company, Phila., Pa.
Lepel High Frequency Laboratories, Inc., N. Y., N. Y.
Rockwell, W. S., Co., Fairfield, Conn.
Surface Combustion Corp., Toledo, Ohio
Trauwood Engr. Co., Cleveland, Ohio
Wilson, Lee, Engr. Co., Cleveland, Ohio

FURNACES—Induction
Lepel High Frequency Laboratories, Inc., New York, N. Y.

FURNACES—Lead Melting
Electric Furnace Co., Salem, Ohio
Rockwell, W. S. Co., Fairfield, Conn.
Surface Combustion Corp., Toledo, Ohio

FURNACES—Pot (oil, gas, electric)
Ajax Electric Co., Inc., Philadelphia, Pa.

FURNACES—Resistance Heating, Strand
(See Annealing Machines)

FURNACES—Salt Bath
Ajax Electric Co., Inc., Philadelphia, Pa.
Electric Furnace Co., Salem, Ohio
Rockwell, W. S. Co., Fairfield, Conn.
Surface Combustion Corp., Toledo, Ohio

GALVANIZING EQUIPMENT — (See MACHINERY—Galvanizing Wire)

GRINDERS—Roll
Norton Co., The, Worchester, Mass.

GUIDES—For Wire
Heany Industrial Ceramic Corp., New Haven, Conn.

GUIDE TIPS—For Extruding Machines (See NOZZLES)

HAMMERS—Nail Heading
Firth Sterling, Inc., Pittsburgh, Pa.
Pittsburgh Carbide Die Co., Monongahela, Pa.

HAMMERS—Swaging
Sjogren Tool and Machine Co., Auburn, Mass.

HARDSURFACING ALLOYS—
(See Alloys—Hardsurfacing)

HOOKS—Pickling & Liming
Youngstown Welding & Eng'g' Co., Youngstown, Ohio

HOISTS—Electric Travelling
Cleveland Tramrail Div. of the Cleveland Crane & Engineering Co., Wickliffe, Ohio

INHIBITORS—Pickling
American Chemical Paint Co., Ambler, Pa.
Apex Alkali Products Co., Philadelphia, Pa.
Parkin Chemical Co., The, Pittsburgh, Pa.

INSULATING MATERIALS—
Electronic Rubber Co., Stamford, Conn.
Heineman Corp., Oscar, Chicago, Ill.
Libbey-Owens, Ford Glass Co., Fiber Glass Div., Toledo, Ohio
Merrimac Paper Co., New York, N. Y.
New England Lacquer Co., E. Providence, R. I.

INSULATING MATERIALS — Paper—For Electric Wire Cable
Merrimac Paper Co., New York, N. Y.

LACQUERING SYSTEMS — See MACH.—Lacquering Electric Wire

LACQUERS—For Electric Wire
New England Lacquer Co., E. Providence, R. I.

LAME—LAHN—
Montgomery Co., The, Windsor Locks, Conn.

LIME—
Warner Co., The, Philadelphia and Bellefonte, Pa.

LUBRICANTS — For Metal Cutting, Stamping and Drawing
Apex Alkali Products Co., Philadelphia, Pa.
Miller, R. H., Co., Inc., Homer, N. Y.
Nopco Chemical Co., Harrison, N. J.
Standard Industrial Compounds Co., Chicago.

LUBRICANTS—Wire Drawing
(See Compounds—Wire Drawing)

LUBRICANTS—Wire Rope
Swift & Co., Chicago, Ill.

MACHINERY—Armoring (Cable, Wire, Hose)
American Insulating Mach'y Co., Phila., Pa.
Sleeper & Hartley, Inc., Worcester, Mass.
Watson Machine Co., Paterson, N. J.
Wire & Textile Mach'y, Inc., (used), Pawtucket, R. I.

MACHINERY—Barbed Wire
Glader Wm., Machine Works, Chicago, Ill.
Wafios, Maschinenfabrik, Reutlingen 3, Wurtt., Germany
Wean Engineering Co., Cleveland, Ohio

MACHINERY—Braiding
Fidelity Machine Co., Inc., Philadelphia, Pa.
New England Butt Co., Providence, R. I.
Wardwell Braiding Mach. Co., Central Falls, R. I.
Wire & Textile Mach'y, Inc. (used) Pawtucket, R. I.

MACHINERY—Bunching
Cook Manufacturing Co., The, Paterson, N. J.
Federal Manufacturing Co., Wallingford, Conn.
Haskell-Dawes Machine Co., Philadelphia, Pa.
New England Butt Co., Providence, R. I.
Niehaus, K. A., Maschinenfabrik, Dusseldorf-Rath, Germany
Sleeper & Hartley, Inc., Worcester, Mass.
Watson Machine Co., Paterson, N. J.
Wire & Textile Mach'y, Inc. (used) Pawtucket, R. I.

MACHINERY—Bundling, Scrap
Sleeper & Hartley, Inc., Worcester, Mass.
Vaughn Machinery Co., Cuyahoga Falls, O.

MACHINERY—Cable, Electric
American Insulating Mach'y Co., Phila., Pa.
Fidelity Machine Co., Inc., Philadelphia, Pa.
Haskell-Dawes Machine Co., Philadelphia, Pa.
New England Butt Co., Providence, R. I.
New York Engineering Co., Yonkers, N. Y.
Niehaus, K. A., Maschinenfabrik, Dusseldorf-Rath, Germany
Sleeper & Hartley, Inc., Worcester, Mass.
Syncro Machine Co., Perth Amboy, N. J.
Watson Machine Co., Paterson, N. J.

MACHINERY—Capstans (See Machinery—Winding Wire)

MACHINERY—Centerless Grinding
Schumag Schumacher Metallwerke, Aachen, Germany.

MACHINERY—Chain Making
Cosa Corporation, New York, N. Y.
Nilson, A. H. Machine Co., Bridgeport, Conn.
Wafios, Maschinenfabrik, Reutlingen 3, Wurtt., Germany

MACHINERY—Closing Rope
Niehaus, K. A., Maschinenfabrik, Dusseldorf-Rath, Germany
Watson Machine Co., Paterson, N. J.

MACHINERY—Coiling Rod
Vaughn Mach'y Co., Cuyahoga Falls, O.
Waterbury-Farrel Fdry. & Mach. Co., Waterbury, Conn.

MACHINERY—Cold Heading
Waterbury-Farrel Fdry. & Mach. Co., Waterbury, Conn.

MACHINERY—Copper Wire Drawing
Aetna-Standard Engineering Co., Pittsburgh.
American Insulating Mach'y Co., Phila., Pa.
National Mach'y Exch. (Used), New York.
Syncro Machine Co., Perth Amboy, N. J.
Torrington Mfg. Co., Torrington, Conn.
Vaughn Machinery Co., Cuyahoga Falls, O.
Waterbury-Farrel Fdry. & Mach. Co., Waterbury, Conn.

MACHINERY—Covering Wire (See MACHINERY—Insulating Wire)

MACHINERY—Crimping Wire
Cedar West Tool Co., New York, N. Y.

MACHINERY—Cutting
Eisler Engineering Co., Newark, N. J.
Lewis Machine Co., The, Cleveland, Ohio
Mettler Machine Tool, Inc., New Haven, Conn.
Utica Drop Forge & Tool Corp., Utica, N. Y.
Wean Equipment Corp., Cleveland, Ohio
Wells, Frank L., Co., Kenosha, Wis.

MACHINERY—Descaling Rod, Dry
Fisher Associates, New York, N. Y.
Herborn, Herborn, Germany.

MACHINERY—Diameter Testing Continuous
Standard Electronic Research Corp., New York, N. Y.

MACHINERY—Die Making
Boulin, Victor J., Inc., New York, N. Y.
Carboloy Dept. General Electric Co., Detroit, Mich.
Dykrex Corp., Roos Tool & Mfg. Div., Newark, N. J.
Firth Sterling, Inc., Pittsburgh, Pa.
International Wire Products Co., Midland Pk., N. J.
Kelly Wire Die Corp., New York, N. Y.
Nord International Corp., Orange, N. J.
Wayne Wire Die Co., Hillside, N. J.

MACHINERY—Draw Benches
Morgan Construction Co., Worcester, Mass.
Torrington Mfg. Co., Torrington, Conn.
Vaughn Machinery Co., Cuyahoga Falls, O.

MACHINERY—Electrode Grinding
Cosa Corporation, New York, N. Y.

MACHINERY—Edging (See MACHINERY — Tandem Rolling and Edging Mills)

MACHINERY—Enameling
American Insulating Mach'y Co., Phila., Pa.
Cook Manufacturing Co., The, Paterson, N. J.
Industrial Ovens, Inc., Cleveland, Ohio
International Wire Products Co., Midland Pk., N. J.
Michigan Oven Co., Detroit, Mich.
Rockwell Co., W. S., Fairfield, Conn.

MACHINERY—Extruding
Aetna-Standard Engineering Co., Pittsburgh.
Davis-Standard Sales Corp., Mystic, Conn.
Royle, John, & Sons, Paterson, N. J.
Wire & Textile Mach'y, Inc. (used) Pawtucket, R. I.

MACHINERY—Fence
Glader, Wm., Machine Works, Chicago, Ill.
Interlocking Fence Co., Morton, Ill.
Wean Equipment Corp., Cleveland, Ohio

MACHINERY—Filament Coil Winding
Eisler Engineering Co., Newark, N. J.

MACHINERY—Flat Wire
Mettler Machine Tool, Inc., New Haven, Conn.
Torrington Mfg. Co., Torrington, Conn.
Wean Equipment Corp., Cleveland, Ohio

MACHINERY—Forming Wire
Baird Machine Co., Stratford, Conn.
Lund Products Div., Artys Sales Corp., New York, N. Y.
Nilson, A. H., Machine Co., Bridgeport, Conn.
Wafios, Maschinenfabrik, Reutlingen 3, Wurtt., Germany

MACHINERY—Fourdrinier Looms
Cedar West Tool Co., New York, N. Y.

MACHINERY—Galvanizing Wire
Sleeper & Hartley, Inc., Worcester, Mass.
Steel Equipment Co., Cleveland, Ohio
Vaughn Machinery Co., Cuyahoga Falls, O.
Wean Equipment Corp., Cleveland, O.
Wilson, Lee, Engr. Co., Cleveland, Ohio

MACHINERY—Gang Winders
Entwistle, Jas. L. Co., Providence, R. I.
International Wire Products Co., Midland Pk., N. J.
Syncro Machine Co., Perth Amboy, N. J.
Watson Machine Co., Paterson, N. J.

MACHINERY—Grinding
Norton Co., The, Worcester, Mass.

MACHINERY—Insulating Wire
Aetna-Standard Engineering Co., Pittsburgh, Pa.
American Insulating Mach'y Co., Phila., Pa.
Davis-Standard Sales Corp., Mystic, Conn.
Ets. Pourtier Frères, Romainville, France
Fidelity Machine Co., Inc., Philadelphia, Pa.
New England Butt Co., Providence, R. I.
Royle, John & Sons, Paterson, N. J.
Syncro Machine Co., Perth Amboy, N. J.
Wardweil Braiding Mach. Co., Central Falls, R. I.
Watson Machine Co., Paterson, N. J.

MACHINERY—Knitting
Fidelity Machine Co., Inc., Philadelphia, Pa.

MACHINERY—Lacquering Electric Wire
American Insulating Mach'y Co., Philadelphia.
Cook Mfg. Co., The, Paterson, N. J.
Industrial Ovens, Inc., Cleveland, O.
Michigan Oven Co., Detroit, Mich.

MACHINERY—Lock Washer
Sleeper & Hartley, Inc., Worcester, Mass.

MACHINERY—Looms, Wire Weaving
Cedar West Tool Co., New York, N. Y.
Interlocking Fence Co., Morton, Ill.
Mummert-Dixon Co., Hanover, Pa.
Wafios, Maschinenfabrik, Reutlingen 3, Wurtt., Germany

MACHINERY—Material Handling
(See Material Handling Equipment)

MACHINERY—Measuring Wire & Cable
Davis Electric Co., Wallingford, Conn.
Durant Mfg. Co., Milwaukee, Wis.
New England Butt Co., Providence, R. I.
Standard Mill Supply Co., Pawtucket, R. I.
Watson Machine Co., Paterson, N. J.

MACHINERY—Nail and Tack
Baird Machine Co., The Stratford, Conn.
Glader, Wm., Machine Works, Chicago, Ill.
National Mach'y Exch. (Used), New York, N. Y.
Seybold Transworld Exporters, New York, N. Y.
Sleeper & Hartley, Inc., Worcester, Mass.
Wafios, Maschinenfabrik, Reutlingen 3, Wurtt., Germany

MACHINERY—Packaging Wire
Coulter & McKenzie Machine Co., Bridgeport, Conn.

MACHINERY—Pickling
Chemsteel Construction Co., Pittsburgh, Pa.
Youngstown Welding & Eng'g Co., Youngstown, Ohio.

MACHINERY—Pin Making
Baird Machine Co., The, Stratford, Conn.
Cosa Corporation, New York, N. Y.

MACHINERY—Pointing
Aetna-Standard Engineering Co., Pittsburgh, Pa.
Morgan Construction Co., Worcester, Mass.
National Mach'y Exch. (Used). New York.
Scudder, E. J., Fdry. & Mach. Co., Trenton, N. J.
Sleeper & Hartley, Inc., Worcester, Mass.
Syncro Machine Co., Perth Amboy, N. J.
Vaughn Machinery Co., Cuyahoga Falls, O.
Waterbury-Farrel Foundry & Machine Co., Waterbury Conn.
Wean Equipment Corp., Cleveland, Ohio

MACHINERY—Poultry Wire Fencing
Interlocking Fence Co., Morton, Ill.
Wean Equipment Corp., Cleveland, O.

MACHINERY—Re-Spooling
Boyd & Sons Manufacturing Corp., Philadelphia, Pa.
Cedar West Tool Co., New York, N. Y.
Davis Electric Co., Wallingford, Conn.
Eisler Engineering Co., Newark, N. J.
Emory, Robert J., Co., Newark, N. J.
International Wire Products Co., Midland Pk., N. J.
Mummert-Dixon Co., Hanover, Pa.

WHERE TO BUY, Continued

For more complete information, consult the annual Wire and Wire Products Buyers' Guide.

National Mach'y Exch. (Used), New York, N. Y.
Steel Equipment Co., Cleveland, Ohio
Vaughn Machinery Co., Cuyahoga Falls, O.
Watson Machine Co., Paterson, N. J.
Wean Equipment Corp., Cleveland, Ohio
Wire & Textile Mach'y, Inc. (used) Pawtucket, R. I.
Wire Insulating Machy., Div. of Machinery Electrification, Inc., Northboro, Mass.

MACHINERY—Rod Mill
Morgan Construction Co., Worcester, Mass.
Schumag Schumacher Metallwerke, Aachen, Germany
Wean Equipment Corp., Cleveland, Ohio

MACHINERY—Rolling Mill
Morgan Construction Co., Worcester, Mass.
Torrington Mfg. Co., Torrington, Conn.
Waterbury-Farrel Foundry & Machine Co., Waterbury, Conn.

MACHINERY—Rubber Insulating
Davis-Standard Sales Corp., Mystic, Conn.
Royle, John & Sons, Paterson, N. J.
Wire & Textile Mach'y, Inc. (used) Pawtucket, R. I.

MACHINERY—Serving
Ets Pourtier Freres, Romainville, France
Fidelity Machine Co., Phila., Pa.
Wardwell Braiding Machine Co., Central Falls, R. I.

MACHINERY—Spark Testing
Davis Electric Co., Wallingford, Conn.
Federal Manufacturing Co., Wallingford, Conn.
Peschel Electronics, Inc., New Rochelle, N. Y.
Wire & Textile Mach'y, Inc. (used) Pawtucket, R. I.

MACHINERY—Spring Making
Carlson Company, The, New York, N. Y.
National Mach'y Exch. (Used), New York, N. Y.
Sleeper & Hartley, Inc., Worcester, Mass.
Torrington Mfg. Co., Torrington, Conn.
Wafios, Maschinenfabrik, Reutlingen 3, Wurtt., Germany
Wells, Frank L., Co., Kenosha, Wisc.

MACHINERY—Staple
Seybold Transworld Exporters, New York, N. Y.
Sleeper & Hartley, Inc., Worcester, Mass.
Wafios, Maschinenfabrik, Reutlingen 3, Wurtt, Germany.

MACHINERY—Straightening & Cutting
Cosa Corporation, New York, N. Y.
Kilmer, M. D., & Co., Cleveland, Ohio
Lewis Machine Co., The, Cleveland, Ohio
Medart Co., The, St. Louis, Mo.
Mettler Machine Tool Co., New Haven, Conn.
National Mach'y Exch. (Used), New York, N. Y.
Wells, Frank L., Co., Kenosha, Wisc.

MACHINERY—Stranding
Haskell-Dawes Machine Co., Philadelphia, Pa.
Milton Machine Works, Inc., Milton, Pa.
New England Butt Co., Providence, R. I.
Niehaus, K. A., Maschinenfabrik, Dusseldorf-Rath, Germany
Sleeper & Hartley, Inc., Worcester, Mass.
Syncro Machine Co., Perth Amboy, N. J.
Watson Machine Co., Paterson, N. J.

MACHINERY—Studmaking
Cosa Corporation, New York, N. Y.

MACHINERY—Swaging
Waterbury-Farrel Foundry & Machine Co., Waterbury, Conn.

MACHINERY—Take-Up and Pay-Out
Aetna-Standard Engineering Co., Pittsburgh, Pa.
American Insulating Mach'y Co., Phila., Pa.
Davis Electric Co., Wallingford, Conn.
Davis-Standard Sales Corp., Mystic, Conn.
Ets. Pourtier Frères, Romainville, France
Federal Manufacturing Co., Wallingford, Conn.
Industrial Ovens, Inc., Cleveland, Ohio
International Wire Products Corp., Midland Park, N. J.
Michigan Oven Co., Detroit, Mich.
New York Engineering Co., Yonkers, N. Y.
Standard Mill Supply Co., Pawtucket, R. I.
Watson Machine Co., Paterson, N. J.
Wire Insulating Machy., Div. of Machinery Electrification, Inc., Northboro, Mass.

MACHINERY—Taping
American Insulating Mach'y Co., Phila., Pa.
Ets. Pourtier Frères, Romainville, France
New England Butt Co., Providence, R. I.
Syncro Machine Co., Perth Amboy, N. J.
Watson Machine Co., Paterson, N. J.
Wire & Textile Mach'y, Inc. (used) Pawtucket, R. I.

MACHINERY—Testing Magnet Wire Coatings for Pin Holes
Peschel Electronics, Inc., New Rochelle, N. Y.

MACHINERY—Testing, Physical
Scott Testers, Inc., Providence, R. I.
Spring Mfgs. Supply Co., Plantsville, Conn.

MACHINERY—Tinning Wire
American Insulating Mach'y Co., Phila., Pa.
Cook Manufacturing Co., The, Paterson, N. J.
Michigan Oven Co., Detroit, Mich.
Steel Equipment Co., Cleveland, Ohio
Syncro Machine Co., Perth Amboy, N. J.
Wean Equipment Corp., Cleveland, Ohio.

MACHINERY—Tinsel Rolling Mills
American Insulating Mach'y Co., Phila., Pa.
International Wire Products Corp., Midland Park, N. J.

MACHINERY—Trolley Wire
Torrington Mfg. Co., Torrington, Conn.
Vaughn Machinery Co., Cuyahoga Falls, O.

MACHINERY—Tube Mill, Cold Drawing
Aetna-Standard Engineering Co., Pittsburgh, Pa.
Mettler Machine Tool, Inc., New Haven, Conn.

MACHINERY—Twinning
(See Mach.—Bunching)

MACHINERY—Twisters, Wire
Cook Manufacturing Co., The, Paterson, N. J.
Davis Electric Co., Wallingford, Conn.
Federal Manufacturing Co., Wallingford, Conn.
Haskell-Dawes Machine Co., Philadelphia, Pa.
International Wire Products Corp., Midland Park, N. J.

MACHINERY—Used
National Machinery Exchange, New York, N. Y.
Wire & Textile Machy., Inc., Pawtucket, R. I.

MACHINERY—for Wire Welding
(See WELDERS—Butt and Spot)

MACHINERY—Washer Forming
Cosa Corporation, New York, N. Y.

MACHINERY—Winding Wire
Cedar West Tool Co., New York, N. Y.
Eisler Engineering Co., Newark, N. J.
Emory, Robert J., Newark, N. J.
Federal Manufacturing Co., Wallingford, Conn.
Michigan Oven Co., Detroit, Mich.
Mummert-Dixon Co., Hanover, Pa.
New England Butt Co., Providence, R. I.
Standard Mill Supply Co., Pawtucket, R. I.
Watson Machine Co., Paterson, N. J.
Wire Insulating Machy., Div. of Machinery Electrification, Inc., Northboro, Mass.

MACHINERY—Wire Bending
Eisler Engineering Co., Newark, N. J.
Kilmer, M. D., & Co., Cleveland, Ohio
Lund Products Div., Artys Sales Corp., New York, N. Y.

MACHINERY—Wire Drawing
Aetna-Standard Engineering Co., Pittsburgh, Pa.
Cook Manufacturing Co., The, Paterson, N. J.
Coulter & McKenzie Machine Co., Bridgeport, Conn.
Herborn, Herborn, Germany
International Wire Products Corp., Midland Park, N. J.
Morgan Construction Co., Worcester, Mass.
National Mach'y Exch. (Used), New York, N. Y.
Schumag Schumacher Metallwerke, Aachen, Germany
Scudder, E. J., Fdry. & Mach. Co., Trenton, N. J.
Sleeper & Hartley, Inc., Worcester, Mass.
Steel Equipment Co., Cleveland, Ohio
Syncro Machine Co., Perth Amboy, N. J.
Vaughn Machinery Co., Cuyahoga Falls, Ohio
Waterbury-Farrel Foundry & Machine Co., Waterbury, Conn.
Wean Equipment Corp., Cleveland, Ohio.

MACHINERY—Wire Forming
Baird Machine Co., The, Stratford, Conn.
Cosa Corporation, New York, N. Y.
Kilmer, M. D., & Co., Cleveland, Ohio
National Mach'y Exch. (Used), New York, N. Y.
Sleeper & Hartley, Inc., Worcester, Mass.

MACHINERY—Wire Rope
Milton Machine Works, Inc., Milton, Pa.
New England Butt Co., Providence, R. I.
Niehaus, K. A., Maschinenfabrik, Dusseldorf-Rath, Germany
Watson Machine Co., Paterson, N. J.

MACHINERY—Wrapping with Paper
Terkelsen Machine Co., Boston, Mass.

MATERIAL HANDLING EQUIPMENT—
Cleveland Tramrail Div. of The Cleveland Crane & Engineering Co., Wickliffe, O.

MILLS—Tandem, Rolling & Edging
Wean Equipment Co., Cleveland, Ohio

NAIL TOOLING—Tungsten Carbide
Firth Sterling, Inc., Pittsburgh, Pa.
Pittsburgh Carbide Die Co., Monongahela, Pa.

NAILS—Wire
Bethlehem Steel Co., Bethlehem, Pa.
Continental Steel Corp., Kokomo, Ind.
Keystone Steel & Wire Co., Peoria, Ill.
Sheffield Steel Corp., Kansas City, Mo.
Wickwire Brothers, Inc., Cortland, N. Y.

NOZZLES—For Extruding Machines
Wire Tool Div., Bridgeport Jig Boring Co., Bridgeport, Conn.

OVENS—Cable Lacquering
American Insulating Mach'y Co., Phila, Pa.
Carl-Mayer Corp., The, Cleveland, Ohio
Industrial Ovens, Inc., Cleveland, Ohio
Michigan Oven Co., Detroit, Mich.
Rockwell Co., W. S., Fairfield, Conn.

OVENS—Rod Bakers
Carl-Mayer Corp., The, Cleveland, Ohio

OVENS—Welding Rod Coating
Carl-Mayer Corp., The, Cleveland, Ohio
Industrial Ovens, Inc., Cleveland, Ohio
Michigan Oven Co., Detroit, Mich.

PAINT—Acid Proof
Ceilcote Company, Cleveland, Ohio

PAINT BONDING CHEMICALS—
American Chemical Paint Co., Ambler, Pa.

PAINTS—Heat Resisting
American Chemical Paint Co., Ambler, Pa.

PAPER—Creped Wrapping
National Waterproof Papers, Inc., Camden, N. J.
Terkelsen Machine Co., Boston, Mass.

PAPER—For Coil Wrapping and Corrosion Prevention
National Waterproof Papers, Inc., Camden, N. J.
Terkelsen Machine Co., Boston, Mass.

PATENT ATTORNEYS—
Lancaster, Allwine & Rommel, Washington, D. C.

PAY-OUT SYSTEMS—
(See MACHINERY—Take-Up & Pay-Out)

PHOSPHATE COATING CHEMICALS
(See COMPOUNDS—Phosphate Coating)

PICKLING COMPOUNDS—
See (Inhibitors—Pickling)

PICKLING—Hooks, etc. Acid Resisting
Youngstown Welding & Eng'g Co., Youngstown, Ohio

PICKLING TANK LININGS—
Chemsteel Construction Co., Pittsburgh, Pa.
Haveg Corp., Newark, Del.
Heil Process Equipment Corp., Cleveland, Ohio

PIPES & FITTINGS—Acid Resistant
Haveg Corp., Newark, Del.

PLASTICS—for Wire Insulation
Electronic Rubber Co., Stamford, Conn.

PLIERS—For Wire
Utica Drop Forge & Tool Corp., Utica, N. Y.

POTS—Lacquer
Industrial Ovens, Inc., Cleveland, Ohio

PRESSES—Hydraulic and Mechanical
Aetna-Standard Engineering Co., Pittsburgh, Pa.

PULLERS AND GRIPS—For Wire
Morgan Construction Co., Worcester, Mass.
Scudder, E. J. Fdry. & Mach. Co., Trenton, N. J.
Sjogren Tool and Machine Co., Auburn, Mass.
Sleeper & Hartley, Inc., Worcester, Mass.
Vaughn Machinery Co., Cuyahoga Falls, Ohio
Wean Equipment Corp., Cleveland, Ohio

PUMPS—Molten Metal
Fisher Associates, New York, N. Y.

REEL AND TENSION STANDS—
Davis Electric Co., Wallingford, Conn.
Fidelity Machine Company, Inc., Philadelphia
Industrial Ovens, Inc., Cleveland, Ohio.
Kilmer, M. D., & Co., Cleveland, Ohio
Moslo Machinery Co., Cleveland, Ohio
New York Engineering Co., Yonkers, N. Y.
Roll-A-Reel, Cincinnati, Ohio
Sleeper & Hartley, Inc., Worcester, Mass.
Standard Mill Supply Co., Pawtucket, R. I.
Syncro Machine Co., Perth Amboy, N. J.
Watson Machine Co., Paterson, N. J.
Wire Insulating Machy., Div. of Machinery Electrification, Inc., Northboro, Mass.

REEL CRUTCHES—
Roll-A-Reel, Cincinnati, Ohio
Watson Machine Co., Paterson, N. J.

REELS & SPOOLS—Aluminum Alloy
Acrometal Products, Inc., Minneapolis, Minn.
Hubbard Spool Co., Garrett, Ind.
Milton Machine Works, Inc., Milton, Pa.
Wardwell Braiding Machine Co., Central Falls, R. I.

REELS & SPOOLS—Annealing and Stranding
Acrometal Products, Inc., Minneapolis, Minn.
Apco Mossberg Co., Attleboro, Mass.
Hubbard Spool Co., Garrett, Ind.
Milton Machine Works, Inc., Milton, Pa.
Mossberg Pressed Steel Corp., Attleboro, Mass.
Republic Steel Corp., Pressed Steel Div., Niles, Ohio

REELS—Metal Bound
Durkee Mfg. Co., Pine River, Minn.
Hubbard Spool Co., Garrett, Ind.
McCaskie, Inc., Wm., Westport, Mass.

REELS—Plywood
Hubbard Spool Co., Garrett, Ind.
McCaskie, Inc., Wm., Westport, Mass.
Nelson Company, The, Baltimore, Md.

REELS & SPOOLS—Steel (All Types)
Acrometal Products, Inc., Minneapolis, Minn.
Apco Mossberg Co., Attleboro, Mass.
Clark, J. L. Mfg. Co., Rockford, Ill.
Hubbard Spool Co., Garrett, Ind.
Mason Can Company, East Providence, R. I.
Milton Machine Works, Inc., Milton, Pa.
Mossberg Pressed Steel Corp., Attleboro, Mass.
New York Engineering Co., Yonkers, N. Y.
Republic Steel Corp., Pressed Steel Div., Niles, Ohio
Wardwell Braiding Machine Co., Central Falls, R. I.

WHERE TO BUY, Continued

For more complete information, consult the annual Wire and Wire Products Buyers' Guide.

REELS—Wire Mill
Acrometal Products, Inc., Minneapolis, Minn.
Apco Mossberg Co., Attleboro, Mass.
Bridge Mfg. Co., The, Hazardville, Conn.
Durkee Mfg. Co., Pine River, Minn.
Hubbard Spool Co., Garrett, Ind.
Mason Can Company, East Providence, R. I.
McCaskie, Inc., Wm., Westport, Mass.
Mettler Machine Tool, Inc., New Haven, Conn.
Milton Machine Works, Inc., Milton, Pa.
Moslo Machinery Co., Cleveland, Ohio
Mossberg Pressed Steel Corp., Attleboro, Mass.
New York Engineering Co., Yonkers, N. Y.
Republic Steel Corp., Pressed Steel Div., Niles, Ohio
Wardwell Braiding Machine Co., Central Falls, R. I.

REELS & SPOOLS—Wooden
American Woodworking Co., Chicago, Ill.
Bridge Mfg. Co., Inc., The, Hazardville, Conn.
Durkee Mfg. Co., Pine River, Minn.
Hubbard Spool Co., Garrett, Ind.
Nelson Company, The, Baltimore, Md.

REFRACTORIES—High Temperature
Norton Company, Worcester, Mass.

ROD BAKERS—
(See OVENS—Rod Bakers)

RODS—Stainless Steel
American Steel & Wire Co., Cleveland, Ohio
Crucible Steel Co. of America, Pittsburgh, Pa.
Pittsburgh Steel Co., Pittsburgh, Pa.

RODS—Steel
Crucible Steel Co. of America, Pittsburgh, Pa.

RODS—Wire—Non-Ferrous
Chase Brass & Copper Co., Waterbury, Conn.
Kaiser Aluminum & Chemical Corp., Oakland, Calif.
Platt Bros. & Co., The, Waterbury, Conn.
Scovill Mfg. Co., Waterbury, Conn.

RODS—Wire, Steel
Bethlehem Steel Co., Bethlehem, Pa.
Colorado Fuel and Iron Corporation, Pacific Coast Division, Oakland, Calif.
Continental Steel Corp., Kokomo, Ind.
Crucible Steel Co. of America, Pittsburgh, Pa.
Keystone Steel & Wire Co., Peoria, Ill.
Pittsburgh Steel Co., Pittsburgh, Pa.
Sheffield Steel Corp., Kansas City, Mo.
Youngstown Sheet & Tube Co., Youngstown, O.

ROPE—Blocks
Madesco Tackle Block Co., Easton, Pa.

ROPE—Wire
American Steel & Wire Company, Cleveland, O.
Bethlehem Steel Co., Bethlehem, Pa.
Roebling's, John A. Sons Corp., Trenton, N. J.

RUST PROOF COMPOUNDS—
(See COMPOUNDS—Rust Preventing)

RUST REMOVING COMPOUNDS—
(See COMPOUNDS—Rust Preventing)

SATURATION SYSTEMS—
Industrial Ovens, Inc., Cleveland, Ohio
New York Engineering Co., Yonkers, N. Y.
Watson Machine Co., Paterson, N. J.
Wire & Textile Mach'y, Inc. (used) Pawtucket, R. I.

SOAPS—Industrial and Wire Drawing
(See COMPOUNDS—Wire Drawing)

SODIUM—for Descaling
du Pont de Nemours & Co., Inc., E. I., Wilmington, Del.

SPOOLS—(See Reels & Spools)

SPOOLS—Stamped Metal for Retail Wire Sales
Clark, J. L. Mfg. Co., Rockford, Ill.
Mason Can Co., East Providence, R. I.

STAMPINGS—Steel
Acrometal Products, Inc., Minneapolis, Minn.
Mossberg Pressed Steel Corp., Attleboro, Mass.

STRIP—Steel
Bethlehem Steel Co., Bethlehem, Pa.
Continental Steel Corp., Kokomo, Ind.
Roebling's, John A. Sons Corp., Trenton, N. J.
Youngstown Sheet & Tube Co., Youngstown, O.

STRIPPERS—Wire, Electric
Utica Drop Forge & Tool Corp., Utica, N. Y.

TANKS—Compound
New York Engineering Co., Yonkers, N. Y.
Watson Machine Co., Paterson, N. J.

TANKS—Pickling and Plating
Ceilcote Company, Cleveland, Ohio
Chemsteel Construction Co., Pittsburgh, Pa.

TESTERS — INSULATION
(See MACHINERY—Spark Testers)

TESTING EQUIPMENT
(See MACHINERY Testing, Physical and Diameter Testing)

TINNING PROCESS—
Metal & Thermit Corp., New York, N. Y.

TINSEL—Electric Conductor
Montgomery Co., The, Windsor Locks, Conn.

TINSEL WIRE—Resistance, Lame, Decorative Cords Thread—Bare Copper, Silver and False Gold Coated, etc.
(See TINSEL—Electric Conductor)

TOOLS—Nail Machine
Pittsburgh Carbide Die Co., Monongahela, Pa.

TOOLS—Welding Wire, Strip & Foil (Pressure)
Utica Drop Forge & Tool Corp., Utica, N. Y.

TOOLS—Wire Cutting
Porter, H. K. Inc., Somerville, Mass.
Utica Drop Forge & Tool Corp., Utica, N. Y.

TRAMRAIL SYSTEMS—
Cleveland Tramrail Div. of the Cleveland Crane & Engineering Co., Wickliffe, O.

TRANSMISSIONS—Variable speed (See Machy—Power Transmission)

TRAVERSES & DRUMS—For Reels
Drums & Traverses (See Drums & Traverses)

TRAVERSE MECHANISMS—
Apco Mossberg Co., Attleboro, Mass.
New England Butt Co., Providence, R. I.
Watson Machine Co., Paterson, N. J.
Wire & Textile Mach'y, Inc. (used) Pawtucket, R. I.
Wire Insulating Machy., Div. of Machinery Electrification, Inc., Northboro, Mass.

TUBE BENDERS AND FORMERS—
Kilmer, M. D., & Co., Cleveland, Ohio

VALVES & FITTINGS—Acid Resistant
Haveg Corp., Newark, Del.

VARNISHES—for Electric Wire
N. E. Lacquer Co., E. Providence, R. I.

VULCANIZING PANS AND EQUIPMENT—
American Insulating Mach'y Co., Phila., Pa.
Mossberg Pressed Steel Corp., Attleboro, Mass.
Wire Insulating Machy., Div. of Machinery Electrification, Inc., Northboro, Mass.

WELDERS—Spot and Butt
Eisler Engineering Co., Newark, N. J.
Hoffman Co., Robt. W., Chicago, Ill.
Micro Products Co., Chicago, Ill.
Utica Drop Forge & Tool Corp., Utica, N. Y.

WIRE—Aluminum
Elmet Division, North American Philips Company, Inc., Lewiston, Maine
Kaiser Aluminum & Chemical Corp., Oakland, Calif.
Malin & Co., The, Cleveland, Ohio
Scovill Mfg. Co., Waterbury, Conn.
Seneca Wire & Manufacturing Co., Fostoria, O.

WIRE—Barbed
Interlocking Fence Co., Morton, Ill.

WIRE—Brass
Chase Brass & Copper Co., Waterbury, Conn.
Scovill Mfg. Co., Waterbury, Conn.
Spencer Wire Corp., Union, N. J.

WIRE—Brush
Spencer Wire Corp., Union, N. J.

WIRE—Bunched & Stranded, Copper
Camden Wire Co., Camden, N. Y.

WIRE—Cast
Youngstown Sheet & Tube Co., Youngstown, O.

WIRE—Cold Heading
American Steel & Wire Co., Cleveland, Ohio
Bethlehem Steel Co., Bethlehem, Pa.
Camden Wire Co., Camden, N. Y.
Chase Brass & Copper Co., Waterbury, Conn.
Colorado Fuel and Iron Corporation, Pacific Coast Division, Oakland, Calif.
Continental Steel Corp., Kokomo, Ind
Crucible Steel Co. of America, Pittsburgh, Pa.
Kaiser Aluminum & Chemical Corp., Oakland, Calif.
Keystone Steel & Wire Co., Peoria, Ill.
Pittsburgh Steel Co., Pittsburgh, Pa.
Scovill Mfg. Co., Waterbury, Conn.
Seneca Wire & Manufacturing Co., Fostoria, O.
Sheffield Steel Corp., Kansas City, Mo.
Wickwire Steel Div., The Colorado Fuel & Iron Corp., New York, N. Y.
Youngstown Sheet & Tube Co., Youngstown, O.

WIRE—Copper
Chase Brass & Copper Co., Waterbury, Conn.
Spencer Wire Corp., Union, N. J.

WIRE—For Electrical Conductors
Camden Wire Co., Camden, N. Y.
Kaiser Aluminum & Chemical Corp., Oakland, Calif.

WIRE—Flat, Fine
Elmet Division, North American Philips Company, Inc., Lewiston, Maine
Montgomery Co., The, Windsor Locks, Conn.

WIRE—Galvanized
Colorado Fuel and Iron Corporation, Pacific Coast Division, Oakland, Calif.
Roebling's, John A. Sons Corp., Trenton, N. J.
Sheffield Steel Corp., Kansas City, Mo.
Wickwire Steel Div., Colorado Fuel & Iron Corp., New York, N. Y.

WIRE—Manufacturers
American Steel & Wire Co., Cleveland, Ohio
Bethlehem Steel Co., Bethlehem, Pa.
Chase Brass & Copper Co., Waterbury, Conn.
Colorado Fuel and Iron Corporation, Pacific Coast Division, Oakland, Calif.
Continental Steel Corp., Kokomo, Ind.
Crucible Steel Co. of America, Pittsburgh, Pa.
Johnson Steel & Wire Co., Worcester, Mass.
Kaiser Aluminum & Chemical Corp., Oakland, Calif.
Keystone Steel & Wire Co., Peoria, Ill.
National Lock Washer Company, The, Newark, N. J.
North American Philips Co., Inc., Elmet Division, Lewiston, Me.
Pittsburgh Steel Co., Pittsburgh, Pa.
Roebling's, John A., Sons Corp., Trenton, N. J.
Scovill Mfg. Co., Waterbury, Conn.
Seneca Wire & Manufacturing Co., Fostoria, O.
Sheffield Steel Corp., Kansas City, Mo.
Spencer Wire Corp., Union, N. J.
U. S. Steel Co., N. Y., N. Y.
Wickwire Brothers, Inc., Cortland, N. Y.
Wickwire Steel Div., Colorado Fuel & Iron Corp., New York, N. Y.
Youngstown Sheet & Tube Co., Youngstown, O.

WIRE—Music
American Steel & Wire Co., Cleveland, Ohio
Johnson Steel & Wire Co., Inc., Worcester, Mass.
Malin & Co., The, Cleveland, Ohio
Seneca Wire & Manufacturing Co., Fostoria, O.
Spencer Wire Corp., Union, N. J.

WIRE—Nickel Silver and Phosphor Bronze
Alloy Metal Wire Div., H. K. Porter Co., Inc., Pittsburgh, Pa.
Chase Brass & Copper Co., Waterbury, Conn.
Malin & Co., The, Cleveland, Ohio

WIRE—Oil Tempered
Crucible Steel Co. of America, Pittsburgh, Pa.
Pittsburgh Steel Co., Pittsburgh, Pa.
Roebling's, John A., Sons Corp., Trenton, N. J.
Sheffield Steel Corp., Kansas City, Mo.

WIRE—Silver Plated Copper
Camden Wire Co., Camden, N. Y.

WIRE—Special Shapes
Alloy Metal Wire Div., H. K. Porter Co., Inc., Pittsburgh, Pa.
Crucible Steel Co. of America, Pittsburgh, Pa.
Continental Steel Corp., Kokomo, Ind.
National Lock Washer Company, The, Newark, N. J.

WIRE—Spring
Alloy Metal Wire Div., H. K. Porter Co., Inc., Pittsburgh, Pa.
Bethlehem Steel Co., Bethlehem, Pa.
Colorado Fuel and Iron Corporation, Pacific Coast Division, Oakland, Calif.
Continental Steel Corp., Kokomo, Ind.
Crucible Steel Co. of America, Pittsburgh, Pa.
Johnson Steel & Wire Co., Inc., Worcester.
Keystone Steel & Wire Co., Peoria, Ill.
Pittsburgh Steel Co., Pittsburgh, Pa.
Roebling's, John A., Sons Corp., Trenton, N. J.
Seneca Wire & Mfg. Co., Fostoria, Ohio
Sheffield Steel Corp., Kansas City, Mo.
Wickwire Steel Div., Colorado Fuel & Iron Corp., New York, N. Y.
Youngstown Sheet & Tube Co., Youngstown, O.

WIRE—Stainless Steel
American Steel & Wire Co., Cleveland, Ohio
Crucible Steel Co. of America, Pittsburgh, Pa.
Firth Sterling, Inc., Pittsburgh, Pa.
National Lock Washer Company, The, Newark, N. J.
Pittsburgh Steel Co., Pittsburgh, Pa.

WIRE—Steel—Also Coppered and Galvanized Steel
Alloy Metal Wire Div., H. K. Porter Co., Inc., Pittsburgh, Pa.
Bethlehem Steel Co., Bethlehem, Pa.
Continental Steel Corp., Kokomo, Ind.
Colorado Fuel and Iron Corporation, Pacific Coast Division, Oakland, Calif.
Crucible Steel Co. of America, Pittsburgh, Pa.
Johnson Steel & Wire Co., Inc., Worcester, Mass.
Keystone Steel & Wire Co., Peoria, Ill.
Pittsburgh Steel Co., Pittsburgh, Pa.
Roebling's, John A., Sons Corp., Trenton, N J.
Seneca Wire & Mfg. Co., Fostoria, Ohio
Sheffield Steel Corp., Kansas City, Mo.
Spencer Wire Corp., Union, N. J.
U. S. Steel Export Co., New York, N. Y.
Wickwire Brothers, Inc., Cortland, N. Y.
Wickwire Steel Div., Colorado Fuel & Iron Corp., New York, N. Y.
Youngstown Sheet & Tube Co., Youngstown, O

WIRE—Straightening and Cutting
Colorado Fuel and Iron Corporation, Pacific Coast Division, Oakland, Calif.
Wickwire Brothers, Inc., Cortland, N. Y.
Wickwire Steel Div., Colorado Fuel & Iron Corp., New York, N. Y.

WIRE—Tinned Copper
Camden Wire Co., Camden, N. Y.

WIRE—Tungsten
North American Philips Co., Inc., Elmet Division, Lewiston, Me.

WIRE—Zinc
Platt Bros. & Co., The, Waterbury, Conn.

WRAPPING PAPER—Creped
(See PAPER—Creped Wrapping)

YARNS & TAPES—Insulating
Heineman Corp., Oscar, Chicago, Ill.
Libbey-Owens-Ford Glass Co., Fiber Glass Div., Toledo, Ohio.

YARN TESTERS—
Scott Testers, Inc., Providence, R. I.

The WATSON MACHINE COMPANY

ESTABLISHED 1845

PATERSON 3, NEW JERSEY, U. S. A.

ELECTRICAL WIRE AND CABLE, WIRE ROPE, CORDAGE
AND MASTICATING MACHINERY MANUFACTURERS

WATSON

HIGH SPEED STRANDERS and CLOSERS "HH"

THESE UNITS, WHICH ARE UNQUESTIONABLY THE MOST ADVANCED, LARGE HIGH-SPEED MACHINE DESIGN OF RECENT YEARS, ARE NOW IN OPERATION IN MANY PROGRESSIVE AND PROMINENT PLANTS, AND HAVE PROVED TO BE THE OUTSTANDING HIGH-SPEED PRODUCER OF WIRE ROPE.

CONSTRUCTION SHOULD NOT BE CONFUSED WITH THE OLD BAR OR SNAKE DESIGNS, AS EACH SPOOL SECTION IS BUILT-UP WITHOUT THRU-RODS OR TUBES.

AVAILABLE FOR 24", 30", AND 40" DIAMETER SPOOLS.

PATENTED "SHAFTLESS" NO-LOOSE-PART BOAT CRADLES WITH INTEGRAL FRICTIONS ARE AVAILABLE. CONVENTIONAL SHAFT-TYPE CRADLES FURNISHED IF A VARIETY OF SPOOL SIZES IS TO BE LOADED.

OPEN CONSTRUCTION FACILITATES ADJUSTMENTS AND ALLOWS UTMOST FREEDOM AND RAPIDITY IN LOADING AND THREADING, THEREBY REDUCING MACHINE DOWN-TIME.

ROTOR IS ALL-STEEL, CHROME-MOLYBDENUM AND BALL-BEARING. TWO-SPEED, CONSTANT HORSE-POWER VEE-BELT DRIVE DIRECT TO ROTOR.

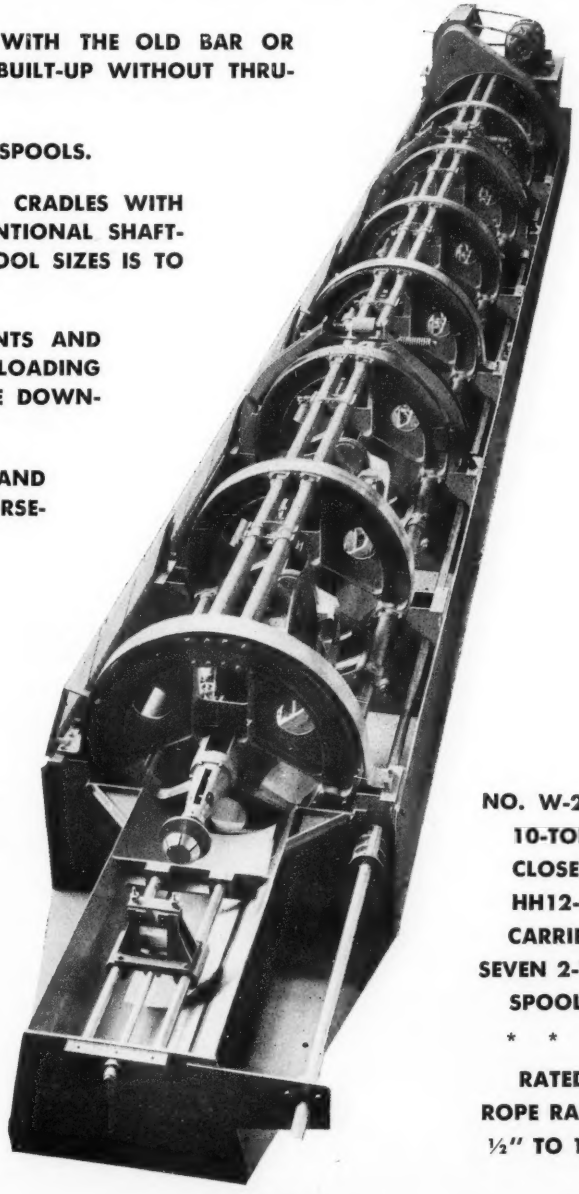
QUIET, NON-METALLIC SUPPORT ROLLERS ON ADJUSTABLE ECCENTRIC MOUNTS.

SPRING-SET, AIR-RELEASED BRAKES PROVIDE RAPID STOPS.

RIGID, ALL-STEEL-BOX FRAME FACILITATES IN-STALLATION AND INSURES PERMANENT ALIGNMENT.

CAPSTANS AND TAKEUPS TO COMPLETE MACHINES ARE AVAILABLE IN MANY TYPES AND SIZES.

NOTE: WE HAVE AND CAN STILL FURNISH LARGE TUBULAR MACHINES: HOWEVER, IN THE SIZES SHOWN THERE IS NO COST AD-VANTAGE, AND THE OBVIOUS FEATURES OF THE "HH" DESIGN PREVENT OUR RECOM-MENDING LARGE TUBULAR ROTORS FOR GENERAL PURPOSE REQUIREMENTS.



NO. W-2477
10-TON
CLOSER
HH12-1
CARRIES
SEVEN 2-TON
SPOOLS

* * *

RATED
ROPE RANGE
½" TO 1½"

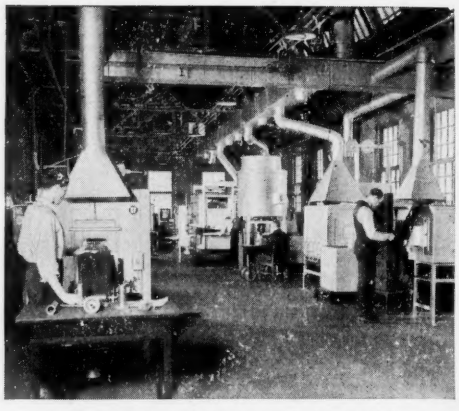
9-54

RESEARCH DEPARTMENT

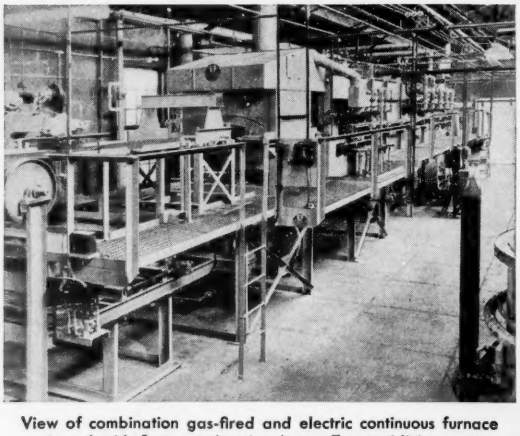
available to

PRODUCERS and PROCESSORS

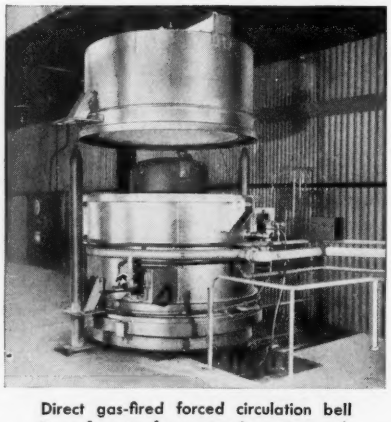
of metals and metal products



General view of the research department showing several of the continuous and batch type experimental furnaces.



View of combination gas-fired and electric continuous furnace equipped with flame preheating burn-off or oxidizing section and controlled heating, soaking and cooling zones, for producing various surface conditions on strip.



Direct gas-fired forced circulation bell type furnace for processing wire, rod, strip and other products.

● The EF research department is equipped with gas-fired, oil-fired and electrically heated continuous and batch units including,—continuous wire mesh furnaces;—endothermic and exothermic special atmosphere generators;—forced circulation bell furnaces;—a continuous roller hearth furnace for treating commercial widths of ferrous and non-ferrous strip;—and other equipment.

Consequently, — from test runs — we can determine accurately the combination of temperature, time cycle, atmosphere and other factors needed to produce the exactly desired results,—assuring—in advance—the efficient performance of EF furnaces *fully up to specifications.*

Many large companies have drawn liberally upon this department in developing new products, and new techniques. Our facilities are available to YOU also — for YOUR research or development work, either gratis or for a moderate fee, depending upon the nature of the experiment. We will be glad to schedule time for your technicians.

Write today for our 12 page booklet, "Research Facilities". It describes the equipment we can place at your disposal.

Gas-Fired, Oil-Fired and Electric Furnaces

for any Process, Product or Production

THE ELECTRIC FURNACE CO.

WILSON ST. at PENNA. R. R. *Salem - Ohio*

Canadian Associates • CANEFCO LIMITED • Toronto 1, Canada